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THE RATIONALE AND TECHNIC OF SYMPATHECTOMY FOR THE RELIEF OF VASCULAR SPASM OF THE EXTREMITIES*

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TIME and experience have shown that any operation having for its purpose the interruption of sympathetic impulses to the blood vessels of the extremities must fulfill three qualifications. First, it must be anatomically complete. Second, it must be physiologically sound. Third, it must be performed in a manner that guards against the regeneration of nerve fibers. The object of this paper is twofold. First, these three matters will be briefly discussed. They have been considered in greater detail elsewhere.[1] Second, the operative technic that I have found best to satisfy these requirements in the case of both the upper and the lower extremity will be described.

To say that an operation must be complete would appear to be an unnecessary statement. If the anatomical arrangement of sympathetic motor pathways to the extremities had been better understood, this would not have been such a difficult problem with which to cope. Obviously, one should know not only the exact segments of the cord that supply vasomotor and sudomotor fibers to the extremities, but also their exact course through the sympathetic trunk after emersion from the spinal cord by way of the white rami communicantes. While this knowledge is not complete, enough is known to state which portion of the outlying sympathetic trunk should be interrupted in order to produce the desired effect. This information has been acquired only by trial and error, and by careful observation of the clinical effect of various operative procedures. The anatomical details will be given in the description of operative technic.

For many years, physiologists have known that a sympathetic motor nerve is composed of two parts. The first portion extends from the gray matter of the cord to an outlying sympathetic ganglion. The latter point is reached by way of the anterior roots and white communicating rami. The second portion extends from the ganglion, where the synapse between the two lies, to the blood vessel wall in which the fiber terminates. This point is reached by way of gray communicating rami and the peripheral nerves.

Immediately after a blood vessel is completely disconnected from central vasoconstrictor impulses, maximal relaxation of the arterial smooth muscle follows. This results in maximal blood flow to the part. By the end of three weeks, however, the arteries regain a certain amount of their tone, and a compensatory mechanism for increasing this tone in response to pain, cold and emotion appears. Thus circulating hormones, adrenaline in particular, carried in the blood stream to the vessel wall, are able to produce vasoconstriction.[2, 3] It has been demonstrated beyond doubt that if the second or postganglionic portion of the pathway has been divided, this compensatory humoral action is approximately three times as great as that resulting from division of the first or preganglionic portion.[4] Hence it becomes apparent that a surgical procedure should, so far as possible, interrupt only preganglionic fibers in order to produce maximal vascular relaxation and maximal blood flow to the part, and to minimize residual vasoconstriction due to this humoral mechanism. An operation therefore should be complete and, furthermore, preganglionic in type.

The ability of sympathetic motor nerves to regenerate makes it imperative to take steps to guard against this action in order to obtain lasting results. Time has shown that a wide separation of the divided ends of the resected nerves is the best assurance against regeneration. The lumbar portion of the sympathetic trunk with its long communicating rami enables one to perform a wide resection of these structures, resulting in adequate separation of the divided parts (several centimeters). At the same time, the location of the

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synapses is such that a preganglionic type of operation can be done.

In the case of the upper extremity, however, the problem is much more difficult. Here, the length of the rami is short. Wide resection of the trunk and ganglia concerned results in a postganglionic type of operation, and even so has been found not to prevent regeneration. It has therefore been necessary to resort to section of the anterior roots within the arachnoid, and to separate the divided ends of the trunk widely. The details of this maneuver will be considered under operative technic.

The Upper Extremity

General Considerations

The operation to be described is the result of years of trial and error. Many different procedures have been utilized. The difficulties encountered have been previously reported by me[5] as well as by others.[6, 7] The present operation has been used in principle for nearly five years. Several modifications have been made. The technic to be described has been in use for nearly two years, and is reported in detail in its present form because I believe that the results are satisfactory, and that no fundamental changes will be necessary.

Anatomically, the sympathetic outflow from the second and third dorsal segments is interrupted by dividing the anterior roots of the second and third intercostal nerves within the arachnoid. The sympathetic trunk is sectioned below its third ganglion. The upper sectioned end is sutured into the wound, the distal end being ligated. This results in a complete sympathetic denervation of the upper extremity, with the exception of any fibers that may be contained in the first dorsal nerve. There is no feasible way to section the outflow from this segment in man in a manner that will prevent regeneration and not cut postganglionic pathways or somatic motor fibers running to the arm. Experience has shown that the sympathetic supply to the arm from this source is not sufficient to be of clinical importance. This operation guards against regeneration because the anterior roots are divided within the arachnoid. The proximal cut ends are therefore within a watertight compartment, and after the meninges heal, regeneration should be impossible. Also, not only are the divided ends of the sympathetic trunk widely separated, but also the upper end is outside the thorax, the lower within. The operation meets the stated requirements of being adequate and preganglionic in type and of guarding against regeneration.

Operative Technic

Under intratracheal anesthesia, a vertical paravertebral incision is made, 7 cm. long and about 5 cm. lateral to the midline. It is centered opposite the space between the second and third dorsal spinous processes. The trapezius fibers are divided transversely for 4 cm. in the center of the wound. The underlying rhomboid muscle is split in the direction of its fibers. A finger can then be passed upward and downward beneath this muscle, and the third rib accurately identified. The inner 4 cm. of this rib is removed through a vertical split in the longissimus capitis muscle. The tip of the transverse process is resected and the underlying rib fragment beveled. The pleura is gently separated to the midline of the vertebral column, to above the second rib and to a point below the fourth rib (Fig. 1).

The third intercostal nerve is next divided at the lateral border of the incision. It is held in a hemostat and lowered into the wound. Dissection is

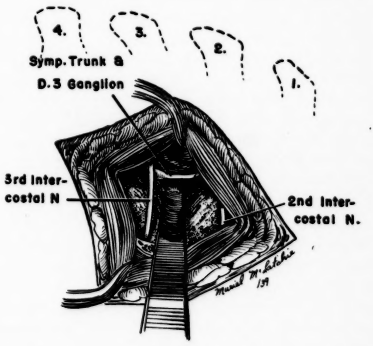

Figure 1.

carried medially along the nerve, dividing first the gray ramus, second the dorsal branch and finally the white ramus. The posterior root ganglion is then clearly seen. A dental spatula can be slipped between the anterior and posterior roots. The latter is divided just proximal to its ganglion, exposing the anterior root as the sole remaining structure. The meninges are gently pushed inwardly along this root until the white, glistening intraspinal portion is brought into view. This is divided, the proximal end retracting within the arachnoid. A spinal-fluid leak of no consequence results from this maneuver. A sketch of a typical specimen of an intercostal nerve removed is shown in Figure 2.

The same procedure is carried out in the case of the second intercostal nerve (Fig. 3). The final step is to divide the sympathetic trunk below the third ganglion (Fig. 4). The distal end

is ligated within the thorax. The proximal end is brought out and sutured into the muscles of the incision (Fig. 5). More recently, the decentralized second and third dorsal ganglia have been covered with a fine silk cylinder to guard further against regeneration. Occasionally an opening in the pleura is inadvertently made. It is best not to try to close it; no difficulty will be encountered if the lung is fully expanded and the extrapleural

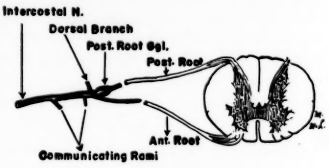

FIGURE 2.

air space obliterated by positive intratracheal pressure before closing the wound tightly. Drainage is never instituted. Silk-suture technic is used. The upper extremities are always denervated separately, about a week apart. There have been no deaths and no serious complications. Between January 24, 1935, and November 1, 1939, one hundred and forty-two upper extremities (82 patients) were denervated by this type of operation.

THE LOWER EXTREMITY

General Considerations

Anatomically, the lower extremity is best denervated by excision of a portion of the lumbar

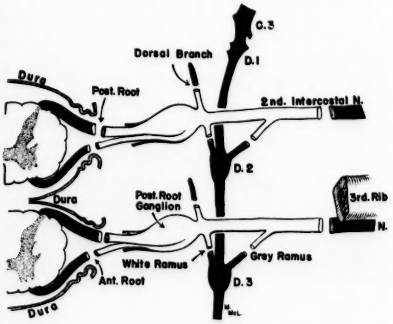

FIGURE 3.

trunk. This contains four ganglia as a rule, but anatomical variations are common. Study of the postoperative effects of interruption of various portions of the lumbar trunk has shown that removal of the first, second and third lumbar ganglia results in complete sympathetic denervation of the thigh and leg. Removal of the second and third ganglia results in a nearly complete denervation of the leg from the knee distally, but the effect on the thigh is not necessarily complete. The

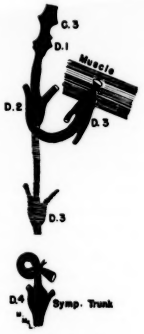

FIGURE 4.

former operation is preferable from the point of view of completeness, but has the disadvantage of interfering with ejaculation in men, owing to excision of the first lumbar ganglion. Both pro-

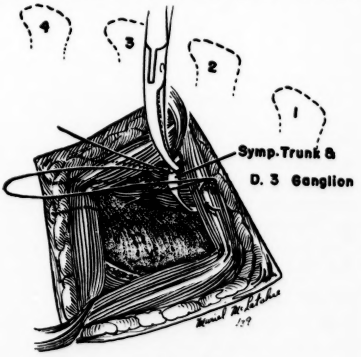

FIGURE 5.

cedures interrupt largely preganglionic fibers running to the leg below the knee, and both seem extensive enough to prevent any regeneration of consequence. Removal of the fourth ganglion adds nothing to the completeness of the operation, and has the disadvantage of interrupting postganglionic fibers running to the lower leg. Most of these arise in the fourth lumbar and upper two or three sacral ganglia.

Sympathetic denervation of the lower extremity as described above is adequate, is largely preganglionic in type and ensures against regeneration of interrupted nerve pathways. As a routine procedure, excision of a portion of the lumbar trunk, including its first, second and third ganglia, and resection of the corresponding communicating rami are practiced in women. In men, the first lumbar ganglion and its communicating rami are not disturbed unless it is thought that the underlying vascular problem justifies their removal. The clinical results so far as relief of vascular spasm is concerned are uniformly satisfactory. Between May 26, 1936, and November 1, 1939, one hundred and three lower extremities (62 patients) were denervated by this technic. There was 1 death due to a pulmonary embolus.

It can be seen that the main purpose is to expose the upper portion of the lumbar sympathetic trunk. Experience has shown that this region is best approached by the extraperitoneal route. If both sides are to be done, the operations are spaced one week apart. This approach is far superior to the transperitoneal operation, which we used extensively up to three years ago. Such a laparotomy is a much more difficult task, and subjects the patient to unnecessary risk and discomfort. Its field of application must necessarily be narrowed to good-risk patients and to those who are certain to derive great benefit from it. Moreover, it is almost impossible to remove the first lumbar ganglion by this route, and often the second ganglion is reached with difficulty if at all. Frequently the third and fourth ganglia are removed, an undesirable step for reasons previously stated. The only advantage of the abdominal approach is that both lower extremities can be denervated at the same time. The many advantages of the extraperitoneal route far outweigh this. A number of excellent extraperitoneal procedures have been described.[8, 9] The following one is that which I have found most useful.

Operative Technic

Either general or spinal anesthesia is used. The latter gives excellent muscular relaxation, and perhaps has an advantage in heavily built individuals. Silk-suture technic is preferred. Drainage is never used.

The patient is placed on his side, with a kidney bar in place just above the level of the iliac crest. The operative field is uppermost. Both knees are drawn upward so that the thighs are approximately at a right angle with the abdomen. This relaxes the iliopsoas muscle group. A medium-sized pillow is placed beneath the undermost thigh, a second pillow is placed between the two thighs and the undermost shoulder is drawn forward. All these steps tend to tilt the patient backward toward the operator. This position is maintained by a strap running diagonally over the legs just below the knees, and by a padded support placed against the sacrum and the back in the scapular region. The kidney bar is then elevated, widening the space between the twelfth rib and the iliac crest and stretching the external oblique muscle. This effect can be intensified by lowering the head and foot of the table a little. The final move is to tilt the table so that the plane of the patient's back is 30 to 45° from the vertical position toward the operator. The latter stands facing the patient's back.

An incision is made, starting in the angle formed by the twelfth rib and the sacrospinalis muscle group (Fig. 6). It runs anteriorly 1 cm. below

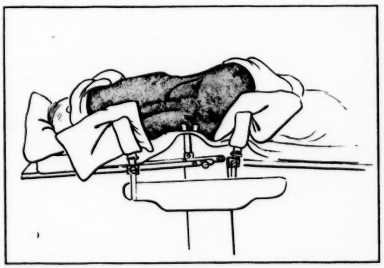

FIGURE 6.

the rib to its tip, then curves anteriorly and downward over the posterior border of the external oblique muscle to the iliac crest. It meets the latter at a point about 7 cm. posterior to the anterosuperior iliac spine. In the posterior portion of the wound, a few fibers of the latissimus dorsi are cut across. The posterior border of the external oblique muscle as it runs from the tip of the twelfth rib to the iliac crest is dissected out and retracted forward. This exposes the internal oblique muscle, whose fibers are divided for about 2 cm. by an incision parallel to the twelfth rib. The lumbodorsal fascia is next incised for 7 cm. in the line of its fibers 1 cm. below and parallel to the twelfth rib. The twelfth nerve lies just above and the first lumbar nerve just below the incision. The first lumbar nerve is plainly seen running downward and forward along the lateral border of the quadratus lumborum muscle (Fig. 7).

A finger is then passed inward, upward and

medially just below the twelfth rib, over the quadratus lumborum and iliacus muscles and posterior to the lower pole of the kidney and peritoneum. It meets the vertebral column in the region of the first lumbar vertebra. The sympathetic trunk is readily palpated on the anterolateral aspect of the spinal column. The finger is gently passed from above downward, separating the peritoneum from the iliopsoas and quadratus lumborum muscles until the trunk has been exposed to below its third ganglion.

A long, moist strip of gauze is gently inserted against the peritoneum, and the latter, including the ureter, and also the vena cava or aorta, can

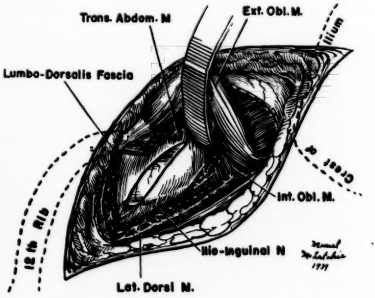

FIGURE 7.

then be gently retracted upward and anteriorly with a long, curved retractor such as the Dever type (Fig. 8). Because of the position of the patient, one can look directly at the sympathetic trunk over the iliopsoas muscle group. It is not necessary to use any posterior retraction except for lighting purposes. The sympathetic trunk is plainly seen, with its second and third ganglia and sets of communicating rami. The first lumbar ganglion and its rami as a rule cannot be perceived until the avascular fascia of the lumbocostal arch has been divided in an upward direction for about 2 cm. On the right side, lumbar veins running into the vena cava may cross over the trunk. This is particularly true of a large, constant branch just below the communicating rami of the third lumbar ganglion. The desired portion of the sympathetic trunk and communicating rami can then be readily removed. This step is facilitated by special instruments, among

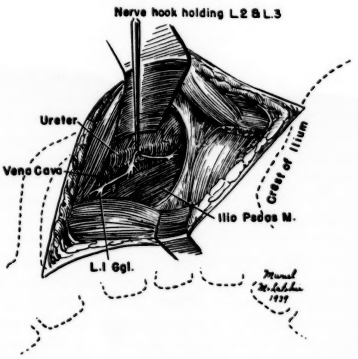

FIGURE 8.

which long Crile hooks and Hartman forceps are particularly useful.

SUMMARY

The rationale of sympathetic denervation of the extremities is discussed.

The surgical technic that I have found to give the best clinical results in the case of both the upper and the lower extremities is described in detail.

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COMPRESSIONS OF THE VERTEBRAL BODIES DURING CONVULSIVE THERAPY*

Preliminary Note Regarding Their Prevention

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IN A recent publication by one of us (E. F.[1]), in which a comprehensive search for complications of convulsive therapy of the psychoses was attempted, hardly pertinent data could be gleaned from the reports of seventy-five clinics with reference to vertebral injuries. The surprising scarcity of subjective complaints referable to the back, even in patients who demonstrate a tendency toward hypochondriasis during convulsive therapy, —seeking any excuse to be released from treatment, — is probably responsible in great part for the belated recognition of this mechanical complication. Another possible cause is the often severe divergence in interest between psychiatric and orthopedic workers. It is believed in retrospect that had an experienced orthopedic surgeon viewed a number of therapeutic convulsions during the incipient days of convulsant therapy, most of the now better-known mechanical complications might have been prevented, such as was done in the preventing of fractures or dislocations at the shoulder and hip joints by methods suggested in the previous paper.

In view of the relatively recent reports by Polatin et al.,[2] Stalker,[3] Wespi,[4] and Bennett and Fitzpatrick[5] regarding dorsal compressions, we have referred to their data concerning accidental compression injuries of the vertebrae. From these sources the uniform conclusion is evident that vertebral compressions occur almost exclusively when the vertebral column is in the flexed position. The similarity between this position in accidental compression and that of the spine during the induced convulsive process is explained in greater detail below.

ANATOMICAL AND ORTHOPEDIC CONSIDERATIONS[6]

The underlying structural peculiarities of the dorsal spine that tend to facilitate compression injuries of this region during induced grand-mal reactions may be briefly described. The dorsal curvature is the first of the spinal curves to develop or to be noticed phylogenetically; it is the first to become fixed in normal skeletal development. The dorsal vertebrae, in contrast to those of the cervical and lumbar regions, form normally an anterior concavity which in the assumption of the upright position brings about a thinning of the anterior portion of the intervertebral fibrocartilage. The disks as well are generally thinner in this region. In the thoracic spine practically all intrinsic movements are limited in order to facilitate respiratory movements via the costophrenic mechanism. The angulation of the superior articular surfaces of the dorsal vertebrae and the contiguity of the inferior articular surfaces and the laminae, together with the approximation of the dorsal spinous processes with each other, inhibit to a great extent respectively flexion and extension movements of the dorsal spine. This architecture and the distribution of the muscles of the trunk, with special favoring of the cervical and lumbar regions, combine to make for a unitary function of the dorsal spine in ordinary locomotion as well as in cases of trauma by a force acting vertically downward and thus directed on the lumbodorsal junction. On the other hand, if the direction of the force becomes reversed the tendency toward involvement of the cervical region, that is the impingement of the dorsal vertebrae as a unit, is evident. Another important feature in spinal injuries is the placement of the anterior and posterior common ligaments, which are essential for holding the vertebral bodies together. The posterior group is much more extensive and is strengthened by the adjacent interspinous and supraspinous groups, as well as by the intertransverse and interlaminar ligaments.

So long as there is a hyperflexion of the vertebral column in a given region, the requisite force imposed on it need not be great in order to cause a compression fracture of the spongy vertebral body. The force required may be even less than that which obtains in normally active people. Various undetermined factors of relative decalcification in the vertebral bodies of patients inactive for years may also play a part — the so-called bone atrophy of disuse. The immediate force must simultaneously compress the vertebral region along its longitudinal axis and flex it. The movable vertebral portion becomes fixed after sudden movement, and the momentum of the vertebral portion above this region crushes the intermediate vertebral bodies. As already mentioned, the compressions occurring in industrial orthopedic practice are found

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chiefly at the junction of the dorsal (relatively rigid) vertebrae with the lumbar or cervical (relatively flexible or resilient) regions. But this condition obtains with the spinal column perpendicular, which is not the case during the induced convulsive procedure wherein force is exerted with the column horizontally disposed. With this in mind, we come to the consideration of the mechanical factors attending the grand-mal reaction per se.

The actual pattern of the Metrazol, or camphor-induced, seizure has been described elsewhere.[7] The phases of this reaction in which vertebral compressions are likely to occur are the tonic

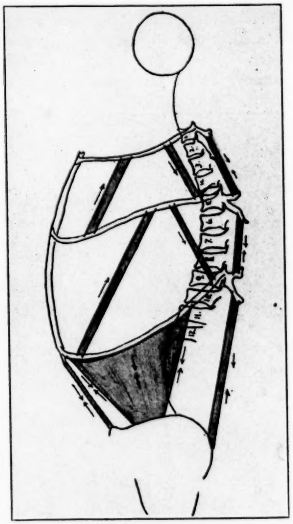

FIGURE 1.

Schematization demonstrating relative extension and flexion muscular forces on the thoracic spine. The excessive leverage of the spinoflexors using the ribs as levers is quite apparent.

and the clonic. In the former the force directed on the vertebrae acts almost continuously, somewhat similar to that observed in tetanus and similar conditions[8]; in the latter the contractures occur in a rhythmically interrupted fashion. The tonic phase imposes a grinding type of action, the clonic phase a hammering type. In either case, an undetermined number of patients will undergo a predominantly opisthotonic phase, while others will demonstrate orthotonos, even emprosthotonos. In the last two forms, particularly, the normal or accentuated dorsal curvature becomes the locus of converging forces. As already stated, the trunk musculature is concentrated either adjacently inferior or superior to the dorsal region; the pelvic and lower-limb and the craniocervical sections jerk in opposing directions, the area of stress being the arch of the relatively rigid dorsal spine. It would appear that this phenomenon, together with the leverage of the anterior thoracic and abdominal muscles exerted through the ribs as spinoflexors during the grand-mal reaction, is directly responsible for midthoracic vertebral compressions. The leverage of the anterior group of muscles appears to be proportionately many times greater than that of the posterior group, which is close to the spine itself (Fig. 1).

STATISTICS

A series of 69 patients have been treated to date by an extensive and as yet incomplete program of convulsive irritative therapy. Four patients had already been discharged on visit at the time of this study and were not available for x-ray examinations. Roentgenological examinations were completed on the remaining 65 patients, lateral, dorsal and lumbar plates being taken of each. Thirteen control patients were similarly studied. The technical details of management of this routine has been described elsewhere.[1] Here, however, we may state that the original measures to prevent mechanical complications consisted only of the application of sheet bands about the lower deltoid and mid-thigh regions so as to allow flexion-extension of the upper and lower extremities but to prevent abduction of the shoulder and hip joints. Additional preventive measures were undertaken later, after it was learned that vertebral compressions might occur during the induced convulsions. This knowledge was obtained only after the courses of treatment had advanced to the degrees noted in Table 1.

No complaints referable to the back were offered, with 1 exception; this patient had negative x-ray findings. Physical examinations of the back and neurological examinations were negative. There were 11 cases of vertebral injuries that con-

TABLE 1. *Cases with Compression Fractures.*

CASE	NO. OF INDUCED CONVULSIONS	DORSAL VERTEBRAE INVOLVED
P. P.	26	6
A. C.	14	6
B. K.	23	5, 6
G. M.	25	6, 7
A. N.	34	7
A. K.	30	8, 9, 10
S. S.	13	5, 6, 7
J. C.	8	7, 8, 9
J. H.	22	7, 8, 9, 10
G. L.	27	3, 4
W. C.	35	4, 5

formed in a general way to the diagnoses of compression fractures of the vertebral bodies. The diagnoses were based entirely on x-ray findings. These findings are listed in Table 1, together with the number of grand-mal reactions induced up to the taking of x-ray films.

One additional case of vertebral compression might be mentioned at this point. The patient, during a determined effort at escape from the hospital, jumped or fell from a second-story window. He sustained fractures of the left os calcis and left elbow. A slight compression of the eighth dorsal vertebral body was also found. From the

TABLE 2. *Observations in Control Cases.*

CASE	INTERPRETATION
P. C.	Apparent bulging of the nucleus pulposus between four lumbar vertebrae (2, 3, 4, 5); probably old.
D. B.	Narrowing of the disk between two lumbar vertebrae (1, 2); probably old.
C. W.	Bodies of six dorsal vertebrae (5, 6, 7, 8, 9, 10) slightly narrowed (the uniformity of this narrowing was indicative of a postural factor); fairly marked dorsal kyphos.
D. M.	Slight narrowing of the body of one dorsal vertebra (12); not of recent origin; probably the result of an injury in early life.

nature of the other injuries the latter finding could reasonably be attributed to the same accident.

It is of interest that only the thoracic vertebrae were involved; the tendency toward involvement of the centrally located bodies should also be noted. This may be contrasted with the involvement after accidental trauma wherein compressions rarely occur above the lowermost dorsal region. In every case the injury occurred in a patient who for a number of years before treatment had been classed as sedentary and hypokinetic. The single exception occurred in Case A. C., that of one who had been active as a laborer and had participated in various entertainments, taking the part of an acrobat. We cannot now prove whether or not this activity was a factor in the presenting injury. There was no correlation between the number or apparent severity of reactions and the occurrence of compressions. For the most part these injuries were not complete fractures of the whole vertebral body, but compressions of one or more of the anterior, superior and inferior portions, causing various degrees of wedging with the base of the vertebral body spared, — again in contrast to that which obtains in industrial work, — accounting, probably, for the absence of local pain in postconvulsive cases.

The possible predisposing factors seem to be as follows: an underlying postural or osteoporotic disorder, and a temporarily co-existing mechanical feature in the handling of the patient during the induction of the convulsion. Although in this paper we intend to emphasize the latter factor, the former must not be neglected. To date, adequate laboratory or roentgenological data to prove the existence of a calcium-phosphorus metabolic disorder are not available. Yet the impression cannot be dismissed that prolonged relative inactivity of the musculoskeletal system makes it more vulnerable to mechanical injuries; at least two textbooks[9] refer to such an osseous condition as porosity from inactivity, and it is commonly called the atrophy of disuse.

In an attempt to gauge the possibility of preexisting postural deformities that might contribute to an orthopedically significant extent to vertebral complications, 13 patients were chosen for x-ray examination of the spine. They were selected arbitrarily, with the mental reservation that they might later be given a course of convulsive irritative therapy. None of the patients received con-

FIGURE 2. *Case S. S.*

vulsive therapy. The observations in 4 of the cases are given in Table 2.

It is perhaps not strictly accurate to class these as control cases of a convulsion-treated group. However, the fact can by no means be disregarded that roentgenologically evident postural deformities do exist in a significant number of the total hospital population. Depending on the type of psychiatric ward, that is in reference to the chronicity of the illness for which the cases are segregated,

in the long-standing hypokinetic cases a variety of postural deformities are commonplace, chief among these being kyphoses, round backs and stooped shoulders. We believe that the abundance of these deformities might easily be overlooked in everyday intramural psychiatric practice were it not for some unusual occurrence or set of observations such as prompted the writing of this paper. Of the group herein described existing deformities were outstanding in over 30 per cent. Vertebral compressions occurred in less than 17 per cent after treatment — we must express it thus since x-ray studies were not made before treatment was instituted.

FIGURE 3. *Case J. H.*

In Figure 2 there is depicted our most severe vertebral compression as a result of treatment. This patient (Case S. S.) received a total of thirteen convulsions. The x-ray interpretation is compressed fractures of the fifth, sixth and seventh dorsal vertebrae, with the width of the body of the sixth reduced to about half normal. Further analysis indicates the probability of a pre-existing kyphotic postural deformity. The greatest strain was apparently directed on the central thoracic vertebrae.

Our next severest injury is shown in Figure 3, which illustrates the dorsal spine of a patient (Case J. H.) after undergoing twenty-two convulsions. The interpretation is definite compression of the seventh, eighth, ninth and tenth dorsal vertebrae. If we now compare the foregoing with one of the controls (Case C. W.), as shown in Figure 4, we have for the latter the following interpretation: the bodies of the sixth, seventh, eighth, ninth and tenth dorsal vertebrae are narrowed; the uniformity of this narrowing is, however, indicative

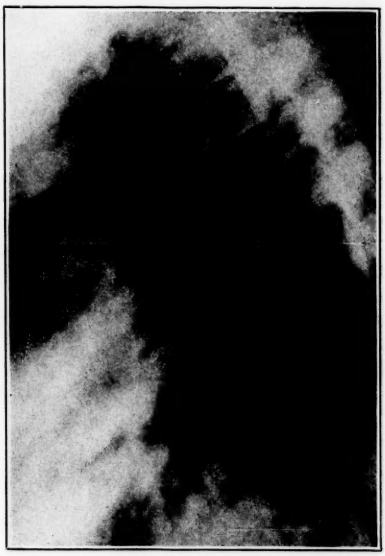

FIGURE 4. *Case C. W.*

of postural disturbance; there is a fairly marked dorsal kyphos. This case indicates how much of a dorsal kyphotic deformity can exist in a patient before treatment is undertaken. The strain during an induced convulsion, or rather repeatedly induced convulsions, would again be directed to the area of greatest curvature, namely the central dorsal vertebrae. So that were not some type of preventive measure undertaken one might almost visualize the area of subsequent compression during induced convulsions.

Figure 5 depicts our least severe injury (Case A. C.). The interpretation is narrowing of the sixth dorsal vertebrae. If we compare this with the film (Fig. 6) from another control (Case

D. B.), wherein the interpretation is narrowing of the disk between the first and second lumbar vertebrae, probably old, a definite mechanical predisposing factor can be made out.

Preventive Measures

Perhaps the most outstanding and, to the orthopedist, most obvious factor with reference to vertebral compressions in the actual administration of the therapeutic convulsion is the manner

Figure 5. *Case A. C.*

in which the patient lies in bed at the time of the attack. As seen from Figure 7, the bed used in most state hospitals allows the patient to be suspended, so to speak, with the entire vertebral axis in an anteflexed position, which permits, if anything, an accentuation of any underlying, even mild, kyphosis. In a patient who is a little heavier than normal the vertebral column is proportionately more flexed. There is permitted more intimate contact of adjacent thoracic vertebrae. We, along with many other workers, have been accustomed to support firmly the shoulders and lower extremities during the reactions, by direct manual means as well as by the sheet bands already mentioned. Whereas this method prevents excessive excursions of the limbs in any direction, it may possibly be an additive factor in causing vertebral compressions, in so far as the added weight of the attendant nurse promotes further sagging of the bed.

After careful consideration of the factors involved in the causation of mid-thoracic vertebral compressions, it was believed that orthopedically the most practical manner of preventing these injuries was to bring about hyperextension of the vertebral column, and at the same time prevent excessive intervertebral impingement at the time of the convulsion; in other words, to offset the lever advantage of the vertebral anteflexor muscles.

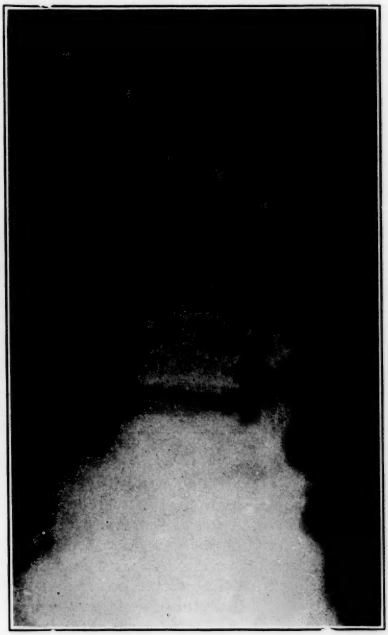

Figure 6. *Case D. B.*

The first measure employed was to place a specially constructed reinforced bolster under the patient's back so as to take up the sag of the bed, and to permit hyperextension of the spine by appropriate maneuvering. This method was workable, but it was found that a certain bolster did not comfortably fit all patients, and considerable maneuvering had to be done in many cases in order to obtain the necessary amount of hyperextension. In

other words, a bolster would have to be constructed for each patient, or else five or ten minutes would be consumed in properly applying this support before beginning treatment. This method also caused a certain amount of pretreatment apprehension, a feature that one must continually guard against in routine convulsive irritative therapy.

FIGURE 7.

On inspection of the various uses of standard surgical beds, we observed that if the patient was put into the bed with his head toward its foot, the appliance on this bed ordinarily employed for elevating and flexing the knees was quite suit-

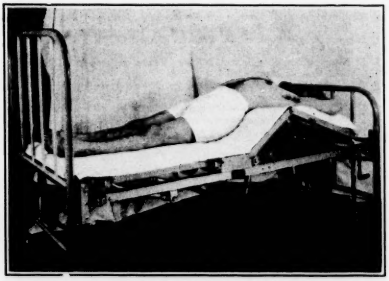

FIGURE 8.

able for our purpose. There was thus available an easily adjustable frame that provided adequate hyperextension of practically the entire spinal column. It was further observed that by means of manual pressure at the shoulders and thighs during the convulsive reaction a maximum amount of intervertebral spacing was achieved. Figure 8 shows the application of the knee support of a standard surgical bed for purposes of hyperextension of the vertebral column. Figure 9 demonstrates the roentgenological evidence of dorsal hyperextension obtained by this method. This plate was taken with the patient lying on the support. During the treatment procedure, of course, the arms and thighs are held medially by means of sheet bands. The patient is placed in bed horizontally, the sheets are applied and the support is raised just prior to the administration of Metrazol. During the entire reaction the shoulders and thighs are firmly held down on each side of the mid-thoracic angulation by attendant nurses. In order to prevent over-hyperextension of the cervical and lumbar vertebrae, a pillow is placed under the head and the hips are firmly pressed in a downward direction. Immediately after the reaction the support is lowered and the sheet bands are removed.

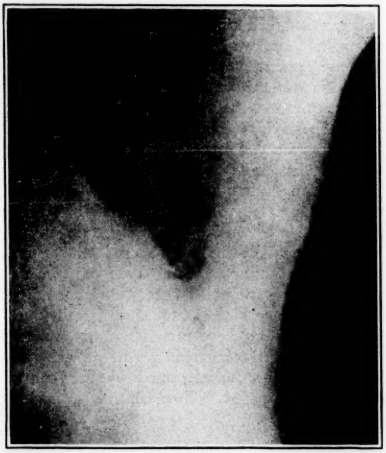

FIGURE 9.

It has been noted that in each case where this method was employed an opisthotonic phase developed which tended even to increase the hyperextended vertebral position in which the patient was placed before the reaction. Up to the time of this report we had employed the above method in conducting the convulsive routine in the cases of 16 patients who had each undergone twenty grand-mal reactions. Lateral lumbar and dorsal x-ray films taken before and after these courses of convulsive treatment revealed no cases of vertebral injury of any type. If one compares these courses of treatment with those of the patients mentioned in Table 1, the two may not appear equivalent. However, as already demon-

strated by Polatin et al.,[2] compressions of the vertebrae may occur even after a single induced convulsive reaction; consequently it would be impossible for us to state with certainty when the compressions occurred with reference to the number of seizures undergone in the first group of patients.

Summary

1. Sixty-five chronically institutionalized psychotic patients were treated by an extensive regime of convulsive irritative therapy. It was found by routine x-ray studies of the dorsal and lumbar spines of all these patients that there had occurred 11 cases of single or multiple compressions of the vertebral bodies, all confined to the mid-dorsal region.

2. None of the patients in whom vertebral compressions had occurred offered any localizing complaints, nor were any neurological or physical findings evident.

3. No relation could be demonstrated between the occurrence of these compressions and the number and severity of the induced convulsions. With one exception, all patients were of the chronic sedentary, inactive type.

4. Anatomical and orthopedic considerations of these findings led to the impression that certain mechanical predisposing and precipitating factors were present. Predisposing factors in the form of kyphoses, ruptured disks and even old compressions of the vertebral bodies were noted in 4 out of 13 control cases. Osseous porosity from disuse might also have been important, but the presence of this factor could not be proved. Precipitating factors were caused by the convulsive procedure per se. These consisted of sudden flexor activities of the trunk musculature which predominated over simultaneous extensor movements because of the extreme leverage of the flexor group of muscles. The already fixed, flexed posture of the dorsal spine accentuated by the sag of the bed during treatment seemed to bring about a convergence of the intermittently acting muscle forces on the arched portion of the dorsal spine, wherein were found all the compression injuries.

5. A workable, practical, preventive measure was demonstrated. This consists of employing the knee-support of the standard surgical bed as an adjustable vertebral hyperextension frame. This appliance seemed to prevent the occurrence of compression injuries to the vertebrae in a series of 16 consecutive cases.

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THE RELATION BETWEEN LEUKEMIA AND TUBERCULOSIS*

Report of a Case

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EXAMINATION of the blood is usually the most important procedure in the diagnosis of leukemia. Occasionally, however, the hematological findings may be misleading: leukemia may be present without typical hematological evidence of it (aleukemic leukemia); or leukemoid blood may be associated with other diseases, especially infections. In the case here reported, a hemic picture typical of chronic myelogenous leukemia was present and led to that diagnosis. Miliary tuberculosis, which was found post mortem, had not been suspected.

The co-existence of leukemoid blood and tuberculosis, usually miliary, has been observed and reported by a number of authors. In a few cases the leukemia was of the lymphoid type; in the majority it was myeloid, as in the present case.

CASE REPORT

M. P. G., a 45-year-old widow, entered the Massachusetts Memorial Hospitals on December 19, 1938, with weakness as the most prominent symptom. The family history revealed nothing of importance except that her husband had died of pulmonary tuberculosis in 1926, after they had been married 13 years. She had felt well until the preceding January, when she began to tire easily and felt a pulling sensation in the left upper abdomen. Shortly afterward she noticed a lump in that region. She consulted her physician, who found an enlarged spleen and made a diagnosis of chronic myelogenous leukemia on the basis of a white-cell count of 180,000, with 58 per cent myelocytes and young forms. Radiotherapy brought about improvement for a time, but later the weakness increased, fever developed, the lower extremities became edematous, and a skin eruption appeared, and about 1 month before entering the hospital the patient was forced to give up her work as a cashier. About 1 week before admission she began to show signs of an upper-respiratory infection, with cough, coryza and aggravation of all symptoms. She had lost 30 pounds in weight since the beginning of her illness.

Physical examination revealed pallor of the skin and evident loss of weight. Thickly scattered over both arms and legs were many discrete, slightly elevated, nodular eruptions measuring 8 mm. in diameter, with a central yellow area 3 mm. or less in diameter (Fig. 1). There was edema of both legs. The cervical lymph nodes were markedly enlarged, nontender and moderately fixed. A few enlarged nodes were present in the axillas and groins. Examination of the heart and lungs revealed nothing abnormal. The spleen was firm and nontender, and extended to the median line and to about 3 cm. below the level of the umbilicus. The temperature was 100.2°F.; during her stay in the hospital it varied between 97.0 and 103.2°F. Urinalysis and serological and chemical examinations of the blood gave normal results, with the exception of a low serum calcium (7.3 mg. per 100 cc.). The blood counts (Table 1) and stained films (Fig. 2) were typical of myelogenous leukemia.

Radiotherapy was administered and Fowler's solution was prescribed. Subjective improvement and a decrease

FIGURE 1. *Maculopapular Eruption and Swelling of the Cervical Lymph Nodes.*

in the number of leukocytes followed. The patient left the hospital at the end of 3 weeks. She rested at home for 2 months and then felt well enough to resume her work.

Three weeks later she was readmitted because of weakness, cough, swelling of the abdomen and fever. Physical examination revealed more obvious loss of weight, increased pallor and abdominal distention. A thick postnasal discharge was present; the nasal mucosa was congested. The cervical lymph nodes, although still enlarged, were smaller than they had been at the previous examination. The cutaneous lesions had healed, but brownish spots remained. The ocular fundi were normal. A few scattered moist rales were heard throughout the chest, and

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there were diminution of breath sounds and dullness at the right base, suggestive of hydrothorax. The heart was normal. The distended abdomen was tympanitic except in the flanks and in the left upper quadrant, where there was flatness, evidently from an accumulation of fluid and an enlarged spleen. The splenic enlargement, however, was less marked than before, extending only 10 cm. below

TABLE 1. *Blood Leukocyte Counts and X-Ray Treatments.*

DATE	LEUKOCYTE COUNT	MYELOCYTES %	X-RAY TREATMENTS
2/21/38	180,000	58	
3/2-25/38			6 treatments, 50 r each (spleen)
3/28/38	65,000	57	
4/4-18/38			4 treatments, 50 r each (spleen)
4/25/38	28,000	44	
5/24/38	18,400	26	
7/29/38	20,100	31	
10/3/38	51,000	40	
12/21/38	62,000	12	
12/22/38			24 r (spray)
12/24/38	45,750	22	10 r (spray)
12/27/38	38,500	10	
12/31/38	32,500		10 r (spray)
1/3/39	56,500	14	
1/9/39	28,000	11	
2/20/39	46,400	39	
3/21/39	83,600	46	
4/7/39	44,000	8	
4/12/39			39 r (spleen)
4/17/39	29,700	6	
4/18/39			39 r (spleen)
4/28/39	15,900	8	
5/4/39	43,400	7	
5/8/39	31,000	3	

the left costal margin. Neurological examination revealed nothing abnormal. Radiography showed slight symmetrical cardiac enlargement and an old tuberculous calcification in the apex of the right lung. A plain film of the abdomen revealed nothing unusual except the splenomeg-

FIGURE 2. *Myelocytes in Stained Film of Blood.*

aly. The electrocardiogram was not remarkable. The basal metabolic rate was +41 per cent. The diagnosis of myelogenous leukemia was accepted by several examiners. The patient gradually failed, finally became comatose and died May 9, 1939.

Autopsy. The peritoneal cavity contained about 8000 cc. of clear, amber fluid. Recently organized fibrous adhesions were found between the intestinal loops, omentum, liver, diaphragm, uterus and ovaries. The omentum was boardlike in consistence and profusely studded with numerous small, slightly elevated, grayish-white, miliary lesions about 1 mm. in diameter. The visceral and parietal portions of the peritoneum presented similar lesions. The right pleural cavity contained 2000 cc. of clear, amber fluid. There were firm adhesions over an old healed calcified scar at the apex of the right lung. The left pleural cavity did not contain fluid but was obliterated by old fibrous adhesions. The spleen weighed 1180 gm. and measured 25 by 15 by 8 cm. Its surface was partially covered by adhesions and by a moderately thick, easily removable, pale yellowish-gray pad of fibrin. The surface of the liver presented a similar appearance. On the cut surface there were pinhead-sized grayish spots that suggested myeloid accumulations. All the serous surfaces of the entire gastrointestinal tract, bladder and pelvic organs were studded with miliary lesions similar to those found on the omentum. The sternal, vertebral and femoral bone marrows were grossly hyperplastic.

On microscopical examination acute miliary tubercles

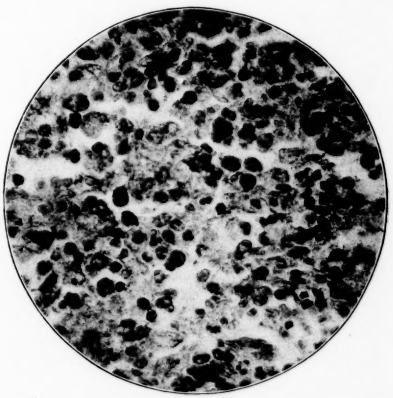

FIGURE 3. *Myeloleukemic Infiltration in the Spleen.*

were found in certain portions of the lungs, with necrotic central areas surrounded by neutrophilic leukocytes, endothelial leukocytes and fibrin. Occasional areas of caseation were present on the capsule of the spleen, with peripheral zones of fibrous connective tissue, phagocytic endothelial cells and rare foreign-body giant cells. Scattered throughout the substance of the spleen were many neutrophilic leukocytes, as well as immature forms of granulocytes (Fig. 3). The capsule of the liver was covered with many young and moderately developed tubercles. Rare caseous foci were seen in the hepatic parenchyma. Around a few of the portal canals there were small accumulations of myeloid cells, but this was much less marked than is customarily the case in chronic myelogenous leukemia. The intestinal serosa was rather uniformly studded with young and moderately advanced miliary tubercles (Fig. 4). About the periphery of some of them small zones of leukemoid infiltration were seen. Acid-fast bacilli were demonstrated. The mesenteric lymph nodes contained discrete and confluent areas of caseation, and in a few there was a suggestion of early leukemoid reaction. In the sternal, vertebral and femoral bone marrows there was complete replacement of the normal structure by massive accumula-

tions of immature myeloid cells, such as are characteristic of myelogenous leukemia (Fig. 5). Miliary tubercles were not found.

In 1849 Virchow[1] reported what was probably the first recognized case of this type. His patient had a large spleen which filled the whole left abdomen and weighed about 1500 gm. There were miliary tubercles in the pons varolii and in the lungs, pleurae, pericardium, liver and kidneys. Although at that time the methods of examining the blood were in an undeveloped stage, the description of the findings leaves little doubt that the blood was leukemoid in character.

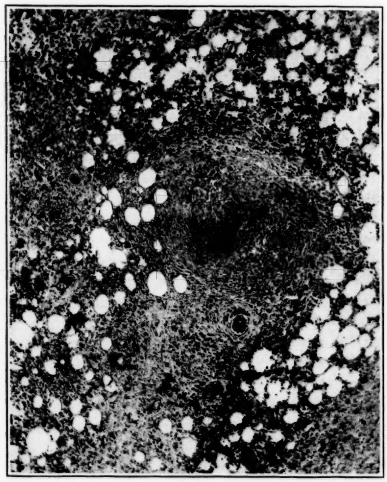

FIGURE 4. *Miliary Tubercle in the Wall of the Intestine.*

The nature of the relation between leukemia and tuberculosis has puzzled nearly everyone who has observed their association in the same patient. Some authorities have believed that the leukemoid character of the blood is an unusual response of the leukopoietic tissues to the tuberculous infection and not true leukemia; others have maintained that in many cases one disease was complicated by the subsequent or previous occurrence of the other. The fact that in the majority of cases the tuberculosis is of the miliary type may be used as evidence for either conception; that is, leukemoid reactions may occur especially in miliary infections; on the other hand, the lowered resistance assumed to be present in leukemia may permit the development of an acute and fulminating miliary form of tuberculosis. The studies of Moreschi and others (quoted by Forkner[2]) showed that the production of antibodies and the phagocytic activity are diminished in leukemia. Jaffé[3] also found that immature leukocytes are deficient in defensive properties.

Susmann,[4] who believed that the two diseases may exist together, postulated three possible combinations: the tuberculosis is latent and is not affected by the subsequently developing leukemia; it is latent and is activated by the leukemia (this is commonest); it supervenes as a terminal infection.

The fact that leukemic infiltration of the internal organs was lacking in the majority of the cases of combined leukemia and tuberculosis has been used as evidence that the blood picture was leukemoid only and not the result of the disease,

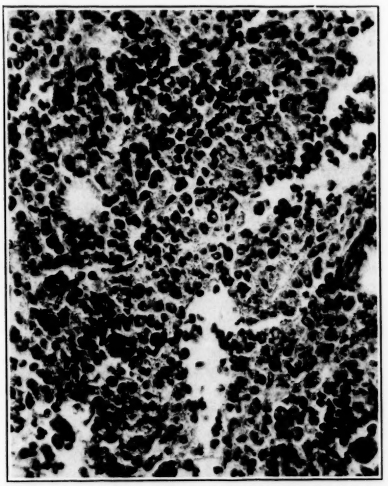

FIGURE 5. *Myeloleukemic Changes in the Bone Marrow.*

leukemia. Support for this contention is supplied by results obtained in the experiments of Feldman and Stasney.[5] They found that rabbits sensitized with tubercle bacilli responded with leukocytosis (up to 124,000 in an animal) to injections of Old Tuberculin, the reaction resembling the so-called "leukemoid" reaction described in human beings. The reactions, however, were of but short duration, lasting only four days or less. The authors assumed that "since the majority of leuke-

moid reactions had occurred in human beings affected with tuberculosis of rather severe proportions, a possible explanation might be the development, previously, of tuberculous allergy or sensitivity of the marrow similar to that which is found in the skin of the majority of tuberculous individuals," and which responded to a subsequent violent tuberculous infection by a marked hyperplasia of the marrow.

But the evidence is not conclusive. The study of a number of the case reports conveys a distinct impression that both diseases were present and that the leukemia antedated an acute flare-up of tuberculosis. It is true that in the majority of such cases leukemic infiltration of the internal organs was absent, but Jackson[6] has called attention to the fact "that patients who have undoubted leukemia . . . may . . . at autopsy show not the slightest evidence of it." In our case the changes in the bone marrow were those of leukemia; there was myeloid metaplasia or infiltration in the spleen and, to a smaller degree, in some of the lymph nodes; the liver contained traces of similar changes. Furthermore, it has been the observation of several authors that there appears to be an antagonism between tuberculosis and leukemia, which may explain the large proportion of cases without leukemic infiltration. At least, it has been found that the signs of leukemia (splenomegaly, lymphadenopathy, leukocytosis, myelocytosis and so forth) abate, and in some cases disappear entirely, with the progression of the tuberculous or other infectious process. This happened in our case: the area of splenic dullness became smaller; the cervical lymph nodes, which had been markedly enlarged, were barely palpable at the time of death; the leukocytosis had receded, and the number of immature white cells had diminished. We believed that these changes were the result of radiotherapy, but in retrospect it appears likely, in view of the experience of others, that the tuberculous infection was at least partly responsible. It would seem, therefore, that the absence of leukemic infiltration of internal organs, which has been emphasized as the most important differential point, does not disprove the diagnosis of leukemia. Hematological study, also, does not help, because in the alleged cases of secondary leukemoid reaction the findings in the blood were similar to those of true leukemia and could not be differentiated from them.

It is important to note that many cases in which the blood picture was assumed to be secondary to tuberculosis resembled acute leukemia. In our case, on the contrary, the early clinical and laboratory data were consistent with chronic myelogenous leukemia; whereas the tuberculous process, with the exception of an old calcified focus in the lung, everywhere had the appearance of being very recent, not more than a few weeks old. Despite the absence, therefore, of definite leukemic infiltration in the liver and other organs, except the spleen and bone marrow, we prefer to regard this case as one of true myelogenous leukemia in which a latent tuberculosis flared up in the form of an acute miliary process. Study of other cases in the future may finally decide whether this is the usual occurrence, or whether in some or all of them the hematologic picture is the result of the tuberculous infection.

The clinical antemortem diagnosis of tuberculosis was made in very few of the reported cases with leukemoid blood reactions. In the majority, as also in our case, tuberculosis was not suspected until it was revealed at autopsy. It seems desirable, therefore, that all cases of this sort be reported until it becomes generally recognized that tuberculosis should be considered, either as a cause or a complication, in any case in which a leukemoid blood picture is found.

Summary

A case of myelogenous leukemia and miliary tuberculosis is reported, and the relation between leukemia and tuberculosis is discussed.

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CLINICAL NOTE

SYSTEMIC AND LOCAL REACTIONS TO EPINEPHRINE IN OIL

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WITH the introduction of epinephrine in oil by Keeney[1] in 1938, the symptomatic treatment of allergic conditions, particularly asthmatic seizures and intractable asthma, has acquired a new impetus. The material can be obtained commercially in ampules, each containing 2.0 mg. epinephrine crystals in peanut oil. Since its inception, this preparation has been employed with increasing frequency by the general practitioner, as well as by the specialist in allergic diseases. Although epinephrine in oil is a valuable therapeutic weapon, the physician should be cognizant of infrequent untoward results that may follow its use.

Murphy and Jones[2] presented a series of 9 cases in which epinephrine in oil was employed. These authors note in 1 patient untoward systemic reactions characterized by nervousness, insomnia, palpitation, nausea, vomiting and headache. No local manifestations were observed. Cohn[3] reports 4 cases in which epinephrine in oil was used with the following unusual symptoms: nausea, vomiting, chills, vesicular urticaria, cyanosis, increased dyspnea and local edema.

Since its introduction I have employed this preparation on 14 patients who did not respond to the usual measures. All these patients were markedly benefited. However, with 2 of them there were untoward reactions each time the preparation was injected: in one, systemic symptoms, such as cold hands and feet, chilly sensations, clammy perspiration, facial pallor, frontal headache and cardiac palpitation; in the other, local manifestations characterized by a preliminary blanching followed by redness, intense itching, marked edema and induration at the site of the injection.

The routine of administration was as follows: 0.40 cc. of epinephrine hydrochloride solution 1:1000 was injected subcutaneously, followed within ten minutes with 1 cc. of sterile peanut oil containing 2.0 mg. of epinephrine injected intramuscularly, the plunger of the syringe always being pulled back before injection, in order to be certain that the preparation was being injected directly into the muscle and not into a blood vessel.

CASE REPORTS

CASE 1. J. B., a 37-year-old man, had suffered from bronchial asthma for the previous 18 years. History and skin tests revealed that the patient was sensitive to both pollen and bacterial products. He was continuously dyspneic. His asthmatic seizures were severe and lasted for days, occasionally even for more than a week, after which his symptoms would abate somewhat, only to return within a few days with a renewed intensity. During these episodes, the patient administered to himself adrenalin chloride vapor (1:100) at very frequent intervals. Oxygen inhalation was resorted to frequently and 0.5 to 1.0 cc. of adrenalin chloride 1:1000 was subcutaneously injected every one or two hours.

When first seen the patient was having a very severe asthmatic seizure, which had failed to respond to the above self-administered measures. Four tenths of a cubic centimeter of epinephrine hydrochloride (1:1000) was injected subcutaneously. This was immediately followed by an injection of 1/75 gr. of atropin sulfate. Shortly afterward the dyspnea began to abate. Ten minutes later an intramuscular injection of epinephrine in oil was given. Within a few minutes the patient complained of feeling chilly. His hands and feet became cold. This was followed by a clammy perspiration and a moderately intense facial pallor. At this time the patient complained of frontal headache and palpitation. These symptoms, which lasted about 1½ hours, were treated by external heat and brandy by mouth. Subsequently on four other occasions it became necessary to repeat the administration of epinephrine in oil, and each time the above train of symptoms appeared. The asthmatic symptoms, however, for the relief of which the epinephrine in oil was administered, were greatly ameliorated.

CASE 2. D. F., a 38-year-old, obese woman, had had bronchial asthma from ragweed pollen for the previous 12 years.

When first seen the patient was having a severe asthmatic attack. Four tenths of a cubic centimeter of epinephrine hydrochloride was administered subcutaneously, followed within ten minutes by an intramuscular injection of epinephrine in oil deep into the deltoid muscle. Within ½ hour marked blanching appeared at the site of the injection. This was replaced slowly by an intense redness, which spread over the shoulder, down the arm and well into the forearm. At the same time, the involved area became markedly edematous and greatly indurated and was very itchy. These symptoms continued for 24 hours and then began to recede. At the end of 6 days the arm had returned to normal. The local reaction was treated with ice packs and cold boric acid compresses. On two other occasions when it became necessary to administer epinephrine in oil, the same train of symptoms appeared, the only variation being that the reactions from the second and third injections lasted 7 and 8 days, respectively. Notwithstanding these untoward local manifestations, the asthmatic symptoms were promptly controlled for a prolonged period of time.

SUMMARY

Epinephrine in oil plays an important part in the symptomatic relief of allergic states.

Its administration is not harmless, for complicating symptoms that are transitory can develop following its use.

The infrequency with which these untoward symptoms occur does not preclude the judicious administration of epinephrine in oil.

Two cases are presented in which the use of epinephrine in oil for symptomatic relief of severe asthma was followed by unusual systemic and local symptoms.

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REPORT ON MEDICAL PROGRESS

OPHTHALMOLOGY

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DURING the past year there has been no spectacular progress in ophthalmology. This report deals with a few selected ophthalmological subjects that have attracted attention in recent years. They have been selected on the basis of general interest.

VITAMIN A

The recent clinical and laboratory developments in the field of vitamin A have centered about the eye. Not only are the outstanding clinical manifestations of vitamin A deficiency ocular, but there is considerable evidence that in the normal state the vitamin A molecule is involved in the visual process taking place in the retina.

Ocular disturbances due to vitamin A insufficiency are of two distinct types. The one involves primarily the epithelium of the cornea, conjunctiva and lacrimal apparatus, and its several clinical manifestations are grouped under the heading of xerophthalmia. The other involves the retinal process concerned with vision, particularly in low illumination, and its clinical manifestation, in the form of poor dark adaptability, is called hemeralopia.

Xerophthalmia is the ocular counterpart of the general mucous-membrane disturbance that occurs in vitamin A deficiency.[1] Like the keratinization of the pulmonary bronchioles, which makes the vitamin-A-deficient patient susceptible to pneumonia,[2] and like the keratinization of the urinary tracts, which gives rise to excessive numbers of epithelial cells in the urine and possibly to renal lithiasis,[3-5] there is keratinization of the corneal and conjunctival epithelium. In the milder forms, xerophthalmia imparts a dry appearance to the eye, and foamy deposits (Bitôt spots) made up of keratinized epithelial cells and saprophytic organisms (*Corynebacterium xerosis*) may appear on the conjunctiva.[6, 7] In the severer form, called keratomalacia, the entire cornea may disintegrate.

Fortunately, xerophthalmia is not common in this country, where the nutrition of the population is good, but it is common in the Far East, and has occurred epidemically abroad at times of limited food supply.[8, 9] Its occurrence in this country is usually in infants, perhaps owing to greater need for this vitamin during growth.[10]

However, several recent observations indicate that the development of xerophthalmia is not dependent solely on vitamin A deficiency. It has been found, for instance,[11] that excess of vitamin D causes typical xerophthalmia, even in the presence of normal vitamin A intake. It has been shown experimentally that excess of sodium chloride with a vitamin B deficit in the diet may produce keratomalacia.[12] There is evidence also that damage to the liver by phosphorus may predispose to the development of xerophthalmia.[13] Calcium deficiency has a similar effect.[14]

There appears to be no good evidence that keratoconus in human beings is the result of vitamin A deficiency, although it may occur in animals recovering from xerophthalmia.[15, 16] There is some evidence, based on the experimental work of Heinsius,[17] that corneal abrasions heal more rapidly when vitamin A is used locally on the eye. Kentgens[18] reports finding a low vitamin A content in the serum of patients with various corneal diseases.

The other ocular manifestation of vitamin A deficiency, hemeralopia, is attracting a great deal of interest both in the biological laboratories and in the clinics. It has been known for some time that vitamin A deficiency is characterized by relative inability of the eye to adapt to conditions of low illumination.[19, 20] It has also been shown that the process of dark adaptation is accompanied by, and is probably dependent on, the formation in the retina of a photosensitive substance called visual purple. In the absence of vitamin A the amount of visual purple formed in the retina is subnormal.[21, 22] It has been suggested by Wald[23] that visual purple is, in fact, derived directly from vitamin A. In favor of this is the presence in the retina of large amounts of vitamin A.[24-26] One must admit, however, that although the chemical formula for vitamin A is known, that for visual purple is as yet unknown.

From the clinical point of view, the fact that vitamin A deficiency is characterized by poor dark adaptation is important, since this function can be measured. The several instruments for measuring it have in common the routine of exposure to a bright light for a known period, and subsequent

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determinations of the light thresholds over a period of at least ten to fifteen minutes.[27] It is probably true that the difficulties inherent in the technic are not generally realized.[28] Defects in dark adaptation are said to reveal vitamin A deficiency before the patient has any subjective complaint.[29] Jeghers[30] claims to have shown by this means that subclinical vitamin A deficiency is present in a surprisingly large proportion of students. Jeans[29] found subclinical hemeralopia in about one fifth of the children entering the pediatric ward in an Iowa City hospital. However, it is by no means certain that the findings with the biophotometer, the instrument used by Jeans and Jeghers, constitute a reliable index of vitamin A adequacy. Not only is the apparatus subject to large errors, but no norm has yet been established with it.[27, 31–34] There are such wide variations of dark adaptation among normal individuals that it is unsafe in the present state of knowledge to diagnose vitamin A deficiency on the basis of this test alone.

Like xerophthalmia, frank hemeralopia in human beings has occurred epidemically when the food supply has been limited.[35] It also occurs occasionally with diseases of the liver,[13, 36–38] owing presumably to failure of conversion of dietary carotene into vitamin A, which normally takes place in this organ. There are a number of other conditions associated with poor dark adaptation which are not known to be dependent on faulty vitamin A metabolism.

Although hypervitaminosis A probably does not occur with the dietary surplus usually taken by human subjects, it is interesting that exophthalmos may be produced in rats with very large doses.[39] In these animals there is also concomitant enlargement of the thyroid gland.

Other Vitamins

There is considerable recent literature pertaining to the role of vitamins B_1 and B_2 in ophthalmology,[40] but one cannot as yet derive any clear-cut conclusions as to their significance for the human eye. On the clinical side it has been pointed out that retrobulbar neuritis is occasionally seen with beriberi,[41, 42] and this has led to the therapeutic use of thiamin chloride in all types of retrobulbar neuritis. It is also pointed out that defects in the central visual field are seen with pellagra,[43] especially with so-called alcoholic pellagra, and this has given rise to the use of nicotinic acid in alcohol-tobacco amblyopia. The therapeutic results have apparently been successful, but in the absence of other signs and symptoms of vitamin B lack neither the usual retrobulbar neuritis nor the alcohol-tobacco amblyopia can as yet be classified as a vitamin deficiency.[44]

On the nonclinical side, it is of interest that in many species of animals the retina is especially rich in lactoflavin[45] one constituent of the vitamin B_2 complex. Lactoflavin is a photosensitive substance,[46] and it has been suggested that it may participate in the visual process, specifically in the reception of the short wave lengths of light. If this proves to be true, it may be found that this substance is analogous to visual purple.

Vitamin C is found in extraordinarily large amounts in the intraocular fluid[47] and in the lens[48] of the eye. It undoubtedly plays an important part in ocular metabolism. That it is vital to the lens is suggested by the fact that it is found to be markedly decreased when the lens is cataractous[48] or has been removed.[47] The therapeutic use of vitamin C to arrest cataract formation, however, has not been successful, and this form of treatment has now been abandoned. The decrease of vitamin C would appear to be secondary to the cataract formation, rather than the cause of it.

Deficiencies in vitamins D and E produce no proved ophthalmic lesions in human beings. It is claimed, however, that vitamin D deficiency and a low-calcium diet will produce keratoconus or an analogous condition in dogs and rats.[49] The treatment of progressive myopia with vitamin D has been as disappointing as other forms of treatment in this condition.[50]

The effect of vitamin K in the treatment of retinal hemorrhages is being currently studied in various clinics, but no comprehensive report of the results is as yet available.

Contact Glasses

Contact glasses are thin shells of glass which may be placed directly on the eyeball and thereby be made to provide an artificial refractive surface. Their chief purpose is to replace the refraction of a distorted corneal surface, but they may also be used cosmetically as a substitute for ordinary glasses.

The principle of contact glasses is not new. A contact device for replacing the corneal surface was suggested by Thomas Young[51] in 1801. It was the logical outcome of his discovery that many visual errors were due to abnormalities of this surface. The accelerated interest in contact glasses during the last few years is due to certain technical advances in their fitting and manufacture which have made the glasses extensively applicable.

Until recently, contact glasses have been made exclusively of glass. They are now manufactured

in this country from plastic as well.* The glass type, which is still the commonest, is either blown or ground. The blown glass is better tolerated by the eye, but almost always contains some optical imperfections. Perhaps a device having the central optical part ground, or at least molded, and the peripheral part blown will be the happy compromise.[52] The plastic type of contact glass has not been in use long enough to allow proper evaluation.

The fitting of a contact glass is not easy.[53] Strange as it may seem, the portion of the glass that fits over the sclera is more important, so far as the patient's comfort is concerned, than the portion that fits over the cornea.[54] Unfortunately, it is the scleral part of the eye that is asymmetric and variable with individuals. Hence, many glasses have to be tried before a properly fitting one is found. Inasmuch as stock glasses may therefore offer considerable difficulty, it has been the practice of some clinics during the last few years to make preliminary molds of the eye with dental composition, and to have glasses specially made to fit the molds.[54, 55] Once a glass is properly fitted, it may be worn for a good part of the day without appreciable discomfort.

The indications for contact glasses are limited.[56] The two outstanding conditions calling for them are keratoconus and irregular astigmatism, in both of which there is a deformation of the cornea that cannot be corrected by ordinary glasses. Another generally admitted indication for contact glasses is high myopia. In this condition contact glasses have definite optical and cosmetic advantages over the ordinary type. There are a host of other possible uses, such as monocular aphakia[57] or as substitutes for regular glasses during certain athletics in which the danger of injury to the eye is less with the former than with the latter.[58] The chief disadvantages of contact glasses are their expense and the fact that they cannot be worn for long periods.

Like most other recent advances, that connected with contact glasses has its quota of overenthusiastic advocates. With full appreciation for the value of these glasses, it would seem that there is hardly sufficient basis for advertising claims such as that which appeared in a recent Boston circular: "Eyeglasses in frames are obsolete—use contact lenses."[59]

Exophthalmos and Thyroid Disease

Two new approaches to the problem of exophthalmos with thyroid disease have yielded profitable results. One, which might be called the therapeutic approach, is Naffziger's operation of orbital decompression for exophthalmos of high degree; the other, coming from the laboratories, is the experimental production in animals of a condition similar to, if not identical with, certain types of exophthalmos in human subjects.

Until recently it has been customary to consider exophthalmos a manifestation of hyperthyroidism, having essentially the same pathogenesis, whatever that may be, in all cases. It has, however, been observed frequently that the degree of exophthalmos is not commensurate with the amount of hyperthyroidism. It has been particularly noted that the severest cases of exophthalmos, the so-called malignant or progressive type, are especially liable to show little or no other evidence of hyperthyroidism, so that the latter alone cannot be held accountable in these cases. It is with progressive exophthalmos that recent progress is concerned.

In 1931 Naffziger devised the operation of orbital decompression for progressive exophthalmos. He at first advocated removing only the roof of the orbit and of the optic canal. More recently he[60] has advocated the removal of some of the lateral orbital wall as well. Although this is obviously a major procedure, it is generally accepted as the operation of choice when loss of the eyes through exposure is imminent. Progressive exophthalmos is not amenable to the usual treatment of hyperthyroidism. Iodinization has no effect, and thyroidectomy often makes the condition worse. Naffziger's operation is therefore the only alternative in many cases. Immediately after it the exophthalmos is worse, but recession of the globe takes place gradually over a period of several months thereafter.

The widespread employment of orbital decompression in progressive exophthalmos has resulted in a fairly large amount of pathologic material becoming available for study. Naffziger and Jones's[61] original findings based on biopsies of the extraocular muscles have been repeatedly confirmed.[62–66] There is a characteristic "proliferation" of round cells, interstitial edema and a Zenker type of degeneration of the muscle fibers.[67] Naffziger believed that the increase in size of the extraocular muscles is alone responsible for the exophthalmos, but it is not evident that he examined other orbital tissues, and more recent studies by others[68] indicate that the extraocular muscles are only part of a generalized orbital infiltration.

As regards the other source of information, that from the laboratories, a few years ago it was found that injections of anterior pituitary extract in the young duck caused exophthalmos.[69] It was then

*Made by Gall and Lembke, 7 East 48th Street, New York City.

tried on guinea pigs and other mammals,[68, 70–72] with the result that a lasting exophthalmos was usually produced. Preliminary removal of the thyroid gland[68, 71, 73] favored its development. The fraction of the anterior pituitary gland responsible for the exophthalmos is apparently the thyrotropic hormone. Removal of the thyroid gland increases the amount of thyrotropic hormone in the pituitary gland[74] and thus enhances the exophthalmos-producing potentialities. The exophthalmos produced by the injection of this hormone is the experimental counterpart of progressive exophthalmos in human beings. The histologic changes in the orbit are the same.[68] Both experimental and clinical exophthalmos are more apt to develop following thyroidectomy. Hyperthyroidism, far from being essential, appears to be actually inhibitory to this type of exophthalmos, for the latter does not develop until the basal metabolic rate has been lowered to nearly normal or to subnormal levels. The clinical use of iodine and thyroxin in the treatment of this type of exophthalmos has, however, been disappointing,[75, 76] although in massive doses thyroxin does have a beneficial effect on experimental exophthalmos. Inasmuch as the doses are near lethal levels, it would be out of the question to use similar amounts in human subjects.

Other glands of internal secretion may affect the exophthalmos either directly or indirectly through the pituitary gland. Exophthalmos is relatively unusual after the decline of sexual life, and Marine[77] reports that gonadectomy prevents experimental exophthalmos in rabbits, while injections of the androgens hasten its appearance. The female sex hormones do not appear to have the same exophthalmos-producing properties that the male hormones have.

The most comprehensive recent review of exophthalmos in connection with thyroid disturbances is that of Brain and Turnbull.[66] These authors differentiate exophthalmic goiter and what they call exophthalmic ophthalmoplegia. The former is Graves's disease, and the latter is what is generally called in this country progressive or malignant exophthalmos. They list the following distinguishing features. Women are affected predominantly in exophthalmic goiter in a ratio of 9:1, whereas in exophthalmic ophthalmoplegia the sexes are about equally affected. The thyrotoxic symptoms and signs other than the exophthalmos are relatively conspicuous in exophthalmic goiter, whereas they are usually slight or absent in exophthalmic ophthalmoplegia. Indeed, in the latter condition there may be hypothyroidism. The usual initial symptom in exophthalmic goiter is nervousness, loss of weight or tremor, whereas the first and frequently the only complaint in exophthalmic ophthalmoplegia is the exophthalmos. Patients with exophthalmic goiter are benefited by iodine and thyroidectomy, while those with exophthalmic ophthalmoplegia show no improvement with iodine and are frequently made worse by thyroidectomy. The response to treatment on the one hand and lack of response on the other may also differentiate the myopathy that occurs in the two conditions. The amount of exophthalmos is greater in exophthalmic ophthalmoplegia, being on an average 7.0 mm., in comparison with 2.5 mm. in exophthalmic goiter. The rate at which the exophthalmos develops is also more rapid in exophthalmic ophthalmoplegia. For the cause in the latter condition Brain and Turnbull accept the thyrotropic hormone theory.

While considerable progress has thus been made in understanding the cases that develop exophthalmos with little other evidence of hyperthyroidism, the mechanism of exophthalmos in Graves's disease is still a mystery. A recent editorial[78] in the *Journal of the American Medical Association* probably represents a majority opinion by unqualifiedly accepting the explanation that the exophthalmos results from sympathetic stimulation. The basis for this belief is of course the fact that exophthalmos may be produced in animals by stimulating the cervical sympathetic chain.[79, 80] But this has not been found to be the case in human beings, and Whitnall[81] denies that there is sufficient smooth muscle in the human orbit to have any appreciable effect. Furthermore, the pupil, which is ordinarily the most sensitive indicator of sympathetic activity,[82] shows no evidence of stimulation in Graves's disease.[83] Nor has sympathectomy had any beneficial effect on the exophthalmos.[84] It would seem wise, therefore, to reserve judgment as to the cause of exophthalmos in Graves's disease until more evidence is available. Fortunately it does not present the clinical problem that progressive exophthalmos does, as it usually yields to adequate therapy of the hyperthyroidism.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTEMORTEM AND POSTMORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 26171

PRESENTATION OF CASE

A twenty-three-year-old man was admitted to the hospital complaining of intermittent cough and hemoptysis.

The patient had been well until six and a half years before admission, when he began coughing while eating sugar-coated cookies. He raised about a teaspoonful of mucoid sputum which "contained blood." Following this he noted a tickling sensation in the throat for several days, although he did not cough. A few months later he developed a severe cough, with sputum and fever that lasted about ten days. A similar attack occurred one month later, but there was no hemoptysis at either time.

About five years before entry similar symptoms reappeared, with the production of moderate amounts of yellowish mucoid sputum. He had "pleurisy" on the left side and was admitted to an outside hospital, where roentgenograms of the chest showed "some density in the left upper lobe." Bronchoscopy was performed, and following this the patient raised copious amounts of yellow, mucoid, odorless sputum for several days. Then the cough and sputum subsided. He was well and entirely symptom-free for the next one and a half years. He steadily gained weight and led a normal vigorous life, except for the fact that throughout this interval he was subjected to repeated diagnostic bronchoscopies at least once every two months.

Four months before admission he again developed fever and a cough with the raising of yellow, mucoid sputum, for which he was readmitted to the same hospital. Repeated therapeutic bronchoscopies were of little aid; however, "calcium and atropine" tablets relieved his symptoms. He was discharged from the hospital without a definite diagnosis. The repeated bronchoscopies were continued about once every four months for the next two years. He felt well, working as a salesman and later as a golf professional. Two years before admission he noticed that he tired easily and that he was losing weight. Artificial pneumothorax was tried as a therapeutic procedure. He then felt much improved, but about two months afterward again had a typical attack of fever and cough, with the production of yellow, mucoid sputum.

X-ray films of the chest showed "fluid at the left base." He was ill ten days and following this was well for months, although the bronchoscopies were regularly repeated and the pneumothorax was continued by refills. One and a quarter years before admission he awoke one morning and coughed up a mouthful of pure, bright-red blood. The sputum was blood-streaked for several days thereafter, but he felt well until one year before entry when an identical attack of hemoptysis occurred, followed by a "streptococcal sore throat" lasting two weeks. He had a temperature of 103°F.; he was nauseated and vomited frequently, and the productive cough recurred; he sometimes raised as much as two cupfuls of yellowish sputum daily. He was hospitalized for seven weeks. Since that time he had never been free of symptoms, the cough with sputum persisting until the present admission, although it was sometimes relieved by dependent drainage. He continued to have pneumothorax refills until six months before entry, although without much relief.

Three months before admission he again coughed up a mouthful of bright-red blood. For three weeks thereafter the sputum was blood streaked. Since then he had had six similar attacks, the last occurring four days before entry. During the year preceding entry the patient experienced a slow but steadily increasing dyspnea on exertion. He lost no weight, although he failed to gain. Throughout the course of the six-year sickness, bronchoscopy was performed sixty-five times. All specimens removed at biopsy were negative. The family and past histories were negative. He entered this hospital for surgical treatment.

Physical examination revealed a fairly well developed and rather poorly nourished man who lay in bed in no acute distress. He coughed at irregular intervals, raising thick, yellowish mucopurulent, odorless sputum. The right chest was definitely larger and more expansile than was the left. Tactile fremitus was diminished, and almost the entire left chest was dull to flat. Over the same area the breath sounds, vocal fremitus and whispered voice sounds were diminished to absent. No wheeze or rales were noted. There was obvious clubbing of the fingers. The heart was negative; the blood pressure was 138 systolic, 80 diastolic. The remainder of the physical examination was negative.

The temperature, pulse and respirations were normal.

Examination of the blood showed a red-cell count of 3,700,000 with 80 per cent hemoglobin, and a white-cell count of 13,200 with 87 per cent poly-

morphonuclears. The urine was negative. The sputum was mucopurulent, contained cocci in chains, but no spirochetes or acid-fast bacilli. A sputum culture showed a moderate growth of beta-hemolytic streptococci. The basal metabolism was + 5 per cent. A glucose tolerance test and the serum calcium, phosphorus and phosphatase levels were all normal.

Roentgenograms of the chest showed consolidation involving the left upper lobe as well as the anterior portion of the left lower lobe, with multiple cavity formation in the same areas. The heart was slightly displaced to the left and showed an inspiratory shift to the left. The right half of the diaphragm showed normal motion; the left was not clearly visible. The right lung showed no significant abnormalities. Films of the hands showed an increase of soft tissues; there was no evidence of periosteal new-bone formation.

The patient remained in the hospital under observation for ten days. On the eleventh day an operation was performed.

Differential Diagnosis

Dr. Frederick T. Lord: May we see the x-ray films?

Dr. Aubrey O. Hampton: The right lung is normal. There are cavities from the apex to the diaphragm on the left side; most of them are apparently in the upper lobe and contain fluid levels. The pleura is thickened over the entire left side, and the left side of the diaphragm is two interspaces higher than normal. The mediastinum has shifted a little to the left in the upper portion, and a little to the right in the lower portion.

Dr. Lord: Is there anything unusual about the bronchi?

Dr. Hampton: I do not see a localized area of fibrosed lung such as you see in chronic bronchiectasis, but there are so many lesions in the lung that it might be obscured. Here there is a suggestion of a localized patch of dilated bronchi in the middle of the left lower lobe.

Dr. Lord: We have a twenty-three-year-old man with six and a half years' disturbance of a respiratory nature, which was at first intermittent and during the past year continuous. For the first four or five years he had complete freedom between the attacks of cough, fever and sputum. During the past year he expectorated a large amount of odorless, purulent sputum, and had shortness of breath and moderate hemoptysis.

The physical signs—dullness to flatness, with diminished breath sounds, tactile fremitus and whispered voice sounds—are very suggestive of bronchial obstruction. However, they are not distinctive of it, so that one cannot draw the conclusion that he had bronchial obstruction from the signs alone. Similar signs are found in other conditions: tumor would produce the same signs, as would multiple cysts not communicating with the bronchi. He had a moderate secondary anemia.

I should like to know more about the sputum; the record gives little of significance. One of the more interesting parts of this story is the large number of bronchoscopic examinations, and I must say that a striking feature about them is that while the record mentions them many times, it says nothing about the findings.

Dr. Ralph Adams: He was bronchoscoped in an effort to make a diagnosis.

Dr. Lord: In an outside hospital?

Dr. Adams: Yes, in fact by an expert bronchoscopist of whose competence there can be no doubt. When he came to Boston the diagnosis remained unestablished.

Dr. Lord: From the bronchoscopic point of view?

Dr. Adams: Yes.

Dr. Lord: That does not help much.

Of course, x-ray study is of great importance in trying to unravel the situation. I should like to know what the x-ray film taken five years ago showed.

Dr. Adams: It showed an increased density on the left side of the chest.

Dr. Lord: That is what the record says. With so many pathologic changes now, it might help to unravel the problem if we knew what he had five years ago.

Dr. Adams: They suspected cancer.

Dr. Lord: It would be desirable to know more about the sputum. Perhaps it is fair to assume that other examinations were made. Tuberculin tests, if necessary up to and including 1 mg. of tuberculin, would be desirable, and also a search of the sputum many times for tubercle bacilli and such other investigations as concentration and culture of the sputum and examination of the gastric contents for tubercle bacilli.

Dr. Benjamin Castleman: All that had been done prior to entry, but nothing was found.

Dr. Lord: According to the x-ray film there is no special suggestion of tuberculosis in the upper part of the chest: there is no finely or coarsely mottled increase of density above the anterior portion of the third rib extending out to the periphery. The use of Lipiodol is an investigation to be considered under these circumstances, but it is questionable as to whether we should get any valuable information out of it.

To come to a conclusion with respect to this problem, I make the diagnosis of chronic pulmo-

nary suppuration with confidence, but I am not so sanguine about unraveling the cause.

I am inclined to exclude tuberculosis. Dermoid cyst seems highly improbable with such a diffuse process.

Bronchial obstruction cannot be excluded, but with the lack of detailed information regarding the bronchoscopic findings it cannot be concluded that he had bronchial obstruction. There is the possibility that at the time he coughed while eating cookies, he inhaled a foreign body with consequent bronchial occlusion and infection beyond the obstruction. A bronchial tumor is another possibility, but with the bronchoscope in competent hands, it is difficult to understand how a tumor in accessible bronchi could be missed. A tumor in the lung itself, invisible by bronchoscopy, is a possibility. Such a tumor would be likely to be of a benign type, as evidenced by the duration of the illness and his good general condition at the time of entry. I have to leave the question of bronchial obstruction without reaching any definite conclusion.

There is evidence of multiple cavities containing purulent material. Owing to the absence of foul sputum, they are unlike the commonest type of lung abscess, and they may have been caused by bronchial obstruction and consequent infection with resulting abscesses, induration and bronchiectasis.

There is another possibility that cannot be excluded, namely congenital cystic disease, which is probably commonor than we have appreciated.

I shall have to make a diagnosis of chronic bronchopulmonary suppuration of undetermined origin, but with such underlying factors as I have suggested as possible causes.

DR. CASTLEMAN: Dr. Churchill, do you remember what your preoperative diagnosis was?

DR. EDWARD D. CHURCHILL: It was bronchial obstruction due to inflammatory stricture or benign tumor. The bronchoscopist who had performed the innumerable bronchoscopies always said that there was a tumor there although he could not reach it.

DR. LORD: Or see it?

DR. CHURCHILL: He saw only a blind ending of the upper-lobe bronchus on that side.

The operation was a total pneumonectomy. We knew we had to find some solution for these recurrent life-endangering episodes of infection. His physician was very anxious about the delay that was necessary to get him on the waiting list, because he was so afraid that the young man would have another very serious episode of infection.

At operation the primary lesion was not evident at first, not until the operation was nearly completed. The apex was adherent, so much so that in dissecting it out the question was raised in my own mind whether we were dealing with bronchial stricture of tuberculous origin; but when I finally had mobilized the lung and reached the hilar region I could feel a round tumor and hence carried the amputation of the lung to a level proximal to the tumor.

CLINICAL DIAGNOSIS

Bronchial obstruction due to inflammatory stricture or benign tumor.

DR. LORD'S DIAGNOSIS

Chronic bronchopulmonary suppuration of undetermined origin.

ANATOMICAL DIAGNOSES

Bronchial adenoma.
Bronchiectasis.
Chronic pneumonitis.

PATHOLOGICAL DISCUSSION

DR. CASTLEMAN: The hilar mass that Dr. Churchill was able to feel at operation was a hard nodular tumor about 2.5 cm. in diameter, which at first glance appeared entirely extrinsic to the main left upper-lobe bronchus but fairly adherent to it. Further examination disclosed that this tumor was an extension of a small intrabronchial non-occluding lesion. In other words, the larger extrinsic portion of the tumor had produced by pressure the bronchial obstruction that had prevented the bronchoscopist from seeing or biopsying the lesion. The cut surface of the lung showed that the upper lobe was completely atelectatic and composed of distended bronchial cavities with a superimposed chronic pneumonitis. The tumor had produced obstruction to one of the bronchi to the lower lobe, and the portion of the lung supplied by this bronchus was similarly involved.

Histologically the tumor is a so-called "adenoma," being composed of small round cells usually arranged in pseudo-acinar formation, definitely invasive locally, and in our experience not malignant. Out of about 20 cases that we have seen only one showed a metastasis to a regional lymph node. Although they are very similar microscopically to the carcinoids of the small intestine, we have never been able to prove that they are argentaffin. In spite of these negative findings Hamperl[1] still believes that they belong in the same group with the carcinoids, although Womack and Graham,[2] of St. Louis, contend that they fit in with their classification of mixed tumors of the lung.

DR. ADAMS: The bronchoscopist's observations throughout the repeated bronchoscopies had been correct, although he could not arrive at a diagnosis. He would look down and see occlusion of the bronchus, and take a biopsy of the hard mass, only to get a report of bronchial mucosa. The bronchial obstruction visible by bronchoscopy was caused by extrinsic pressure from tumor that had grown downward into the hilus, from its origin in a peripheral bronchus.

DR. CHURCHILL: The importance of this tumor at the moment lies in the confusion that exists between it and true bronchiogenic carcinoma. In our series of bronchiogenic tumors the ratio of incidence of benign adenoma to microscopically proved carcinoma is 1:10. If we include cases of cancer of the lung not proved microscopically the ratio is approximately 1:20. However, if we begin to talk about the results of operative treatment and narrow our discussion to resectable bronchiogenic tumors then the ratio becomes 1:4. In other words, of resectable bronchiogenic tumors we find 25 per cent are benign adenomas and 75 per cent true bronchiogenic cancers. One can readily shift the results in cancer of the lung toward the optimistic side by including these tumors. This pitfall has already been recognized. The cancer of the lung cured by bronchoscopic removal that was referred to many years ago by Jackson has been reviewed by C. L. Jackson,[3] his son, and interpreted as having been a bronchial adenoma. The series of cases treated by Manges,[4, 5] of Philadelphia, with radiation treatment, with which he got surprisingly good results, has been gone over and the good results are all interpreted as having occurred in cases with bronchial adenoma.

In passing, we might note that the young man survived the operation and should remain well without danger of recurrence or metastasis.

DR. DONALD KING: It might be of interest to report our experience to date with benign adenomas. We have now observed a total of 21 cases, 11 in males and 10 in females. Of the males, 2 were over fifty years of age, 5 were in the thirties, 1 was twenty-two, and 3 were under twenty; of the females, 2 were over sixty, 4 were in the thirties, 2 were in the twenties, 1 was eighteen, and 1 was six. Of the total number, 7 are dead and 14 living. Of the dead, 1 was treated by bronchoscopy alone, 1 by bronchoscopy and radium seeds and 1 by bronchoscopies, radium and x-ray; 2 died after lobectomy, and 2 were discovered only at postmortem examination. Of the 14 living, 5 had bronchoscopic removal of the tumor with no other treatment, 1 had radium seeds implanted, 3 had pneumonectomy, 4 had lobectomy, and in 1 the adenoma was removed through the trachea. At the present time it seems reasonable in most cases to remove as much of the tumor as possible through the bronchoscope, but it is probable that the majority of the cases will have to have lobectomy later if the pulmonary condition is to be cured.

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CASE 26172

PRESENTATION OF CASE

First Admission. A sixty-six-year-old mason was admitted to the hospital complaining of an "infected corn" of about seven days' duration.

The patient was treated conservatively with hot moist boric applications to the foot lesion. Diabetes was discovered and he was placed on a diabetic diet with small doses of insulin. He improved steadily, the urine became sugar-free, and he was discharged to be followed in the diabetic outpatient clinic.

Final Admission (four years later). He entered the hospital because of the onset of low abdominal pain seven hours previously. About seven years before this admission the patient first noticed the onset of recurrent attacks of abdominal pain. Characteristically, without known cause or relation to food, there was a gradual onset of midepigastric pain, which became maximal in an hour and was described as a sharp, severe, colicky distress which radiated to the left lower quadrant of the abdomen. Occasionally the pains passed from "side to side." When they occurred he was usually constipated and was subject to attacks of belching, but he passed no flatus by rectum. He was able to obtain relief from the pain, constipation and belching by either taking Epsom salts or enemas, or both. These episodes usually occurred at about bi-weekly intervals, and on rare occasions were so severe that hypodermic medication was required for the relief from pain. Three years before admission he was studied in an outside hospital where the examination, including repeated x-ray studies and a gastrointestinal series, was reported as negative.

The attacks continued, and three months before entry he lost his former vigor, became weak and had to stop work. He became constipated, had frequent attacks of pain, each lasting six to seven

hours, and on a few occasions vomited "black bile," with little relief. He volunteered the information that so long as his bowels were "open" he had no discomfort. He became obstipated for several days one month before admission. Two days prior to and on the day of admission he suffered severe attacks of abdominal pain, each lasting two to four hours and leaving him with a generalized abdominal soreness. Hypodermic medication gave relief from the pain of the last attack, but six enemas attempted on the afternoon of admission were without results. He had taken no insulin prior to entry.

Physical examination revealed a sick man whose abdomen was distended, tympanitic and diffusely tender; there was slight spasm in both lower quadrants. By rectal examination there was equal tenderness bilaterally, but no masses or other abnormalities were noted. The blood pressure was 190 systolic, 70 diastolic, and the pulse was very irregular.

The temperature was 99.8°F., the pulse 94, and the respirations 20.

Examination of the blood showed a red-cell count of 3,860,000 with 65 per cent hemoglobin (Tallqvist), and a white-cell count of 5100 with 36 per cent adult polymorphonuclears, 56 per cent young polymorphonuclears and 8 per cent lymphocytes. Three days later the white-cell count was 11,100 with 96 per cent polymorphonuclears, the majority of which were young forms. The urine was negative save for a very slight trace of albumin and an olive-green sugar test. The blood nonprotein nitrogen was 55 mg. per 100 cc., the chlorides equivalent to 90.5 cc. of N/10 sodium chloride, the protein 5.2 gm., the van den Bergh test normal, indirect, and the sugar 187 mg. An electrocardiogram showed auricular fibrillation, with a ventricular rate of 150, but no definite evidence of any other abnormality.

Roentgenograms of the abdomen in the supine position showed no unusual amount of gas in the bowel. A film in the upright position showed several horizontal levels with small air bubbles in the mid-abdomen. In the region of the cecum and ascending colon there was a soft-tissue mass, but it was not ascertainable whether it was the cecum filled with fecal material or a shadow of intussuscepted bowel.

The patient's temperature rose steadily, and he was obviously becoming increasingly sicker. A Miller-Abbott tube was passed, but its tip failed to enter the pylorus. Urinary sugar tests after the admission specimen were negative, and there was no diacetic acid or acetone.

He was transfused, given digitalis and treated conservatively. He quickly failed and died on the fifth hospital day.

Differential Diagnosis

Dr. Edward Hamlin, Jr.: May we see the x-ray films?

Dr. George W. Holmes: The gas that we see is almost wholly in the large bowel. There is a small collection here which might be in the ileum or lower small bowel. If this is small bowel, I should not call it dilated. So far as the film is concerned, we have no help whatever, except to say that there is no evidence of distended small bowel. The film taken with the patient standing shows these levels of fluid and gas. The patient had had several enemas, however, so that he may have had fluid in the large bowel, a possibility which makes this observation of no particular value. If we are going to be asked to determine the presence of abdominal fluid levels in the small bowel, we should have a patient who has not had an enema just before examination.

Dr. Hamlin: There is no evidence of free intraperitoneal fluid?

Dr. Holmes: No, but the x-ray films do not always show it.

Dr. Hamlin: We have a seventy-year-old man, who was apparently a mild diabetic, with a seven-year story of what sounds like intestinal obstruction. The first thing to ascertain is whether it is obstruction of the small or large bowel. The location of the pain in the mid-epigastrium is evidence of small-bowel obstruction, but because of the facts that the pain radiated to the left lower quadrant and that the attacks were always concurrent with obstipation and apparently relieved by enemas and Epsom salts — a curious way of relieving intestinal obstruction — I prefer to think that his difficulties were due to large-bowel obstruction. The attacks became worse, and he eventually entered the hospital in a very severe attack. We are not told the type of pain; the record merely states that it was abdominal pain.

The physical examination tells us nothing about whether he was cachectic but it does give us evidence of a diffusely tender abdomen, with slight spasm in the lower quadrant and tenderness by rectum.

The laboratory helps only by showing that there was obviously an attempt by the leukocytes to react to an infection of some sort. The elevated blood nonprotein nitrogen would go with either intestinal obstruction or peritonitis. Low blood chlorides usually indicate vomiting, but we have not been told that there had been vomiting in the immediate illness. I should like to know

whether the stool examination showed blood, but presumably with the enemas there was nothing on which to determine that.

So we come down to the diagnosis of large-bowel obstruction of long duration, which I believe had perforated. The causes of perforation in such a large-bowel lesion may be several: an intermittent volvulus, a chronic intussusception, as was suggested by the x-ray interpretation, a diverticulitis, or possibly, if we can eliminate some of the old story, a carcinoma of the large bowel. The story is entirely consistent with diverticulitis; in fact it is almost a textbook picture, with the exception that increased flatus is usually described.

It is possible that the auricular fibrillation had led to the throwing off of an embolus and the subsequent development of mesenteric thrombosis, but if we include the entire story that does not seem likely. So with nothing more to go on, I make my first choice, diverticulitis of the cecum, with perforation and peritonitis.

Dr. Tracy B. Mallory: Would anyone care to offer another diagnosis? Dr. Hamlin's diagnosis agreed with the discharge diagnosis on the ward.

Dr. Wyman Richardson: I suggest a diagnosis of large-bowel obstruction, probably due to carcinoma of the large bowel.

Clinical Diagnoses

Generalized peritonitis.
Diverticulitis, acute.
Arteriosclerosis, generalized.
Diabetes, mild.

Dr. Hamlin's Diagnoses

Diverticulitis, acute, with perforation.
Generalized peritonitis.

Anatomical Diagnoses

Obstruction of ileum from adhesive band (? congenital).
Perforation of ileum.
General peritonitis.
Meckel's diverticulum.
Hypertrophy of prostate, benign, lateral lobe, slight.
Trabeculation of bladder, slight.
Nephritis, chronic vascular, slight.
Arteriosclerosis, coronary arteries and aorta, slight.
Pulmonary atelectasis.

Pathological Discussion

Dr. Mallory: This was a very blind case, and in retrospect the only possible lead was the original localization of the pain; the lesion was in the small bowel and not the large. It was of rather unusual character. He obviously had had chronic obstruction of the lower ileum for many years due to a very dense fibrous adhesive band, which was not accounted for by any previous operation. So the question arises as to whether this band was congenital in origin. The other finding was an entirely unsuspected Meckel's diverticulum, which lay 30 cm. above the adhesive band and had nothing to do with it. However, just above the adhesion was a small perforation of the ileum, about 1 cm. in diameter, from which general peritonitis had resulted. It was, apparently, a spontaneous rupture immediately behind the point of obstruction. There was no neoplasm.

A Physician: You might well have expected some free gas in the abdomen.

Dr. Arthur W. Allen: The films were probably taken before perforation occurred.

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PROGRESS IN CANCER CONTROL

Since April has been dedicated as Cancer Month, it is appropriate that the Division of Adult Hygiene of the Massachusetts Department of Public Health,* which is charged with the cancer control work in this state, should report on its activities and accomplishments during 1939.

Again, Massachusetts has the proud distinction of being the only state in the Union, indeed the only place in the world, which had a falling cancer death rate in women. There was also a slight drop in the rate for men.

The attendance of cancer patients at the cancer clinics has increased from an average of 758 per year prior to 1935 to 1676 in 1939. Of the latter patients, 22.4 per cent went to their physicians within a month of the first symptoms of the disease. This is an all-time record for early diagnosis of cases of cancer.

The interest of physicians in the cancer clinics is shown by the facts that 85 per cent of the patients coming to the clinics were referred by physicians, that the clinics are voluntarily staffed by physicians in the local communities and that the annual attendance of physicians at consultation and teaching clinics has increased from an average of 229 for the first years of the program to 1364 in 1939.

An increase has also been noted in the utilization of the Tumor Diagnosis Service, maintained jointly by the Massachusetts Department of Public Health and the Harvard Cancer Committee for the use of those physicians without adequate laboratory facilities for the histological diagnosis of cancer. The average number of specimens received for diagnosis from 1927 to 1935 was 2813 annually. In 1939, 3620 were received, and the number of surgeons using the Tumor Diagnosis Service increased from an average of 421 to 738.

The Massachusetts Medical Society may well congratulate itself on the work that it has done in furthering the diagnosis and treatment of cancer. But it must not regard its responsibility as in any way lessened, but rather heightened, by the fact that apparently this particular enemy of mankind is in grudging retreat.

Cancer Bulletin. No. 81. Massachusetts Department of Public Health, Division of Adult Hygiene. April, 1940.

ARMY EXPERIENCE FOR PHYSICIANS

An announcement, published elsewhere in this issue of the *Journal*, indicates the intention of the War Department to offer one year of active duty with the United States Army to civilian physicians under thirty-five years of age who will accept appointment in the Medical Corps Reserve in order to permit them to be placed on such duty.

This announcement is, in effect, an invitation to the medical profession to contribute its share in time of peace toward the organization of national defense. Congress has provided for augmentation of the strength of the Army, both in the regular establishment and in the National Guard. Peacetime maneuvers on an unprecedented scale are authorized and planned for the spring and

summer of this year. Reserve officers are being called to active duty for specified periods of time in order to expedite augmentation in an orderly fashion and to provide commissioned personnel for the maneuvers to be held.

The compelling logic underlying these plans, in the unsettled state of the world at present, can scarcely be questioned. The proposal to offer reserve commissions to young qualified physicians is intelligent and timely, since the Army not only may attract some of them into the regular service but also will train the majority to perfect themselves for the possible, if fervently undesired, day when wartime mobilization takes the place of peacetime maneuvers.

The announcement should offer a distinct appeal to many recent graduates in medicine who have either finished or are about to finish their training as interns. The year of service, if accepted, is essentially a postgraduate internship in military medicine with rates of pay and allowances set at assured and attractive levels. An unequaled opportunity is presented to learn the duties of the physician as an officer, duties which become more specialized in the military sense as new tactics and technics are adopted by the combat branches. He who secures active service for a year under the conditions offered can be well satisfied that he is not only discharging a fundamental civic duty but is also preparing himself to play an essential part in the event of disaster afflicting this nation as it has already afflicted so many other peaceful ones.

MEDICAL EPONYM

Bowman's Capsule

William Bowman (1816–1892), assistant surgeon to the King's College Hospital and demonstrator of anatomy in King's College, London, read before the Royal Society on February 17, 1842, a paper "On the Structure and Use of the Malpighian Bodies of the Kidney, with Observations on the Circulation through that Gland." This was printed in the *Philosophical Transactions of the Royal Society of London* (**132**: 57–80, 1842).

> The Malpighian bodies I saw to be a rounded mass of minute vessels invested by a cyst or capsule* of precisely similar appearance to the basement membrane of the tubes. Seeing these similar tissues in such close proximity, it was not easy to resist the conviction that the capsule was the basement membrane of the tubes expanded over the vessels. . . . Having, during last summer, been made acquainted, through the kindness of Dr. Milne Edwards, with a new method of injection employed with great success by M. Doyère of Paris,** I injected some kidneys through the artery, by this method, in order to notice the nature of the vascular ramifications in the Malpighian bodies. I not only found what I sought, but the clearest evidence that the capsule which invests them is, in truth, the basement membrane of the uriniferous tube expanded over the tuft of vessels.
>
> *First particularly pointed out by Müller, who conceives it to be perfectly closed, except at one point where perforated by the vessels.
>
> **This consists of two fluids which mingle in the small vessels, and cause a precipitation there. The best fluids are saturated solutions of bichromate of potass and of acetate of lead. They are injected in succession through the same vessel, whence the method is termed that by double injection. Krause published an account of it two years ago, but M. Doyère appears to have arrived at it after a laborious trial of numerous solutions. Both deserve the thanks of anatomists for so valuable an addition to the means of investigation.
>
> R. W. B.

OBITUARY

LeRoi Goddard Crandon

1873–1939

On December 27, 1939, Doctor LeRoi G. Crandon died after a long and slowly progressive, but happily painless, illness. To very many of us who called him "friend," the occasion of his death would seem to call for some comment, however brief, in the columns of the *Journal*. We are not sure that he would have desired any such comment.

His educational equipment was of the best, both by inheritance and acquisition. His father, a strikingly handsome, lovable and courteous gentleman was originally a minister of the Unitarian Church but later became associated with the Society for Ethical Culture. He was an ardent and discriminating collector of books, a trait strongly inherited by his son. His mother and sisters also supplied a sturdy New England background of intellectuality and clear thinking. Doctor Crandon received his A.B. *cum laude* from Harvard University in 1894 and his M.D. *cum laude* in 1898. Many years later (1909) and while carrying on a very large and insistent practice, he worked for and received his A.M. in philosophy from Harvard University. How he ever found time to do the hard work and intensive reading required for this particular degree, all the while engaging in a practice that carried on night and day, almost beggars understanding. His endurance seemed endless. Working tirelessly throughout the day

and evening (and often into the night) on public and private hospital patients, he not infrequently studied until two or three o'clock in the morning. It is doubtful if he ever averaged more than five or six hours sleep during this period. And yet through it all he maintained a serenity of manner and an unusual quietness of speech, not always properly appraised by some of his colleagues.

Receiving an appointment in surgery at the Boston City Hospital in 1898, he made a brilliant record as a house officer, and in 1903 became a member of the Visiting Surgical Staff, holding that position until 1919, when he resigned. As a surgeon he was conservative, sure of his technic, meticulous as to details, never spectacular and possessed of excellent surgical judgment. Fortunate were those house officers who had their training under him, and doubly fortunate the patients who came under his direct professional care. He was a master of postoperative care, and his book, *Surgical Aftercare,* embodied all the principles he practiced and taught; the book went through two editions, was adopted by the United States Army and went through several translations into foreign languages. He taught surgery for many years at the Harvard Medical School, both clinical and laboratory; the latter consisted of operative surgery on the cadaver and was conducted in conjunction with the late Dr. George H. Monks. His surgical papers were many and valuable, especially those dealing with diseases of the prostate, appendicitis, fractures of the base of the skull, and difficulties with the feet due to improper shoes. His style was direct and forceful with well-chosen words and phrases. His expressed ideal in these respects was the late Dr. David W. Cheever, whose scholarly lectures on surgery — later printed in book form but unfortunately not now readily available — were his model.

During the World War he served in the Navy at New London, Connecticut, organizing United States Naval Hospital, No. 9, a thousand-bed plant. His excellent service was recognized, and he shortly was promoted to the rank of lieutenant commander. He was later given the rank of commander.

Of avocations Doctor Crandon had few. He was a great lover of books, and his collection on Arctic exploration was outstanding in character and number of volumes. Over a long period, yachting was an engrossing pastime with him. An able navigator, he possessed in the course of years two fine schooners, the *Nokomis* and the *Black Hawk,* both of which he himself sailed. For a time he was commodore of the Boston Yacht Club.

No sketch of the life of Doctor Crandon would be complete without some reference to what became to him in his later years a matter of most intense devotion. In 1923 he became absorbingly concerned with psychic research. This interest was stimulated and made possible by the mediumship of his wife, Mina Stinson Crandon ("Margery"), and lasted until his failing health called a halt. He became an active member of American and British societies for psychical research, his interest being, as he himself said, purely objective and scientific. He made several trips to England for discussion of scientific matters bearing on psychic phenomena with Sir Conan Doyle and Sir Oliver Lodge, and in turn was visited very many times in his home on Lime Street by scientific investigators from this country and abroad. As one of Doctor Crandon's closest friends says of him, "Brilliant as was his surgical career, it is probable that he will be remembered more especially for his connection with psychic research." To the end, he was the scientific observer of these psychic phenomena. Mediumship has always been a controversial and bloody battleground, and that of "Margery" was no exception. Doctor Crandon believed absolutely and unwaveringly in the integrity of the mediumship of his wife. So believing, he fought valiantly, asking and giving no quarter, and regardless of the number or the character or the fame of the opposition. As is well known, they left nothing undone to discredit him. Knowing the man as some of us did, one can be certain that he would have been the first to demolish the whole structure and admit its fallacies if he had believed for one moment that the observed psychical phenomena were unsound or explainable by purely natural methods.

To a host of patients, Doctor Crandon, because of his unremitting devotion, kindliness and skill, was the ideal and beloved physician. To a very great number of doctors to whom he was always an unfailing friend, able counsellor and skillful surgeon, he was a never-failing help, and their devotion and loyalty to him were as great as the regard of his patients. A remarkable tribute to the real affection and respect which so many people of all walks of life held for him was shown in the outpouring of the friends who attended the funeral service. All felt a deep and heartfelt grief at the loss of a friend.

D. D. S.

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY

RAYMOND S. TITUS, M.D., *Secretary*
330 Dartmouth Street
Boston

Beginning on September 28, 1939, and running through April 18, 1940, cases dealing with the treatment of uterine sepsis were presented in the *Journal*. An attempt was made to show the change from unintelligent to intelligent treatment — from invasion of the uterus and symptomatic treatment to that based on non-interference with the uterus and a knowledge of the specific infectious agent. The policy of letting the uterus alone evolved from the observation of the dire results that frequently followed its invasion. It is surprising that it took the profession so long to conclude that puerperal infections should be attacked from the etiologic point of view, but this was undoubtedly stimulated by the recent successful treatment with chemicals of other diseases of known bacterial etiology. Today the treatment of such infections is intelligent. The uterus is looked on only as the portal of entry of the infection, and is never itself invaded except for hemorrhage. The disease is attacked, as are nearly all other infections, by attempts, with stained smears and cultures, to determine the bacterial invader, and the method of treatment depends on this specific knowledge. In this respect the treatment of puerperal sepsis has at last been placed on a solid foundation, and the results are very gratifying. The few cases of cesarean section that were reported illustrate that subsequent sepsis without peritonitis should be treated in the same way as sepsis following pelvic delivery.

In the subsequent issues of the *Journal* a series of cases of pyelitis during pregnancy will be presented. The first ones will be those treated twenty-five years ago, when treatment was entirely symptomatic. These will be followed by cases in which kidney lavage played an important therapeutic role. Lastly will be the recent cases in which lavage and chemotherapy have been used with excellent results.

THE MASSACHUSETTS CANCER PROGRAM*

The Massachusetts Cancer Program has just completed its thirteenth year of operation. The results of this long-continued attack on cancer are being realized. During the past year the outstanding accomplishments were: a continuation of the shorter period of delay between first recognizable symptoms and visit to physician first noted in 1936; a larger percentage of individuals going to their physicians in the first month of the disease; a far greater use of the Tumor Diagnosis Service; more individuals coming to the clinics than ever before; sixty-three teaching clinics attended by 1364 physicians; an extension of the Co-operative Cancer Control Committees; and the opening of two new cancer clinics.

Question: During the past few weeks I have heard a large number of physicians ask if the fall in the cancer death rate among women is continuing. This seems to be the most important question in the minds of those interested in cancer. Will you discuss this?

Dr. Lombard: The 1939 adjusted cancer death rate for women again showed a decline over the previous years. This decline from the all-time high in 1925 of 130.0 per 100,000 population is now approximately 4 per cent. This may not seem large, but it represents a saving of several hundred lives, and if the decline continues in the years to come, many more lives will be saved.

Question: The question of delay is another of great importance. In the cancer clinic population there are three types of delay — that before the visit to the first physician, that between this period and attendance at a clinic and that between attendance at the clinic and treatment. In the ordinary hospital population there are only two types of delay — that before the visit to the first physician and that between the visit to a physician and the institution of treatment. The summation of all delays depicts the time wasted between first symptoms and treatment. Will you differentiate these delays and discuss their significance?

Dr. Lombard: The interval between first symptoms and the visit to first physician represents a delay on the part of the public. In the early part of the program this delay was nearly seven months. In the last few years it has been decreasing, and in 1939 it was only five months. This, of course, is too long, but it shows that the educational efforts being expended by the Massachusetts Department of Public Health and co-operated in by some 15,000 organizations in the State are having results. The second delay, that between the visit to a physician and attendance at a clinic, was only about one third as long last year as in the early days of the clinic. The third delay, that between attendance at a clinic and treatment, is very short due to the excellent work of the social-service departments. While the total delay in Massachusetts clinics averages some nine months, it is much shorter than that reported from other states, and it is also shorter than that reported from Massachusetts hospitals. Apparently the reason for this is the shortening of the interval of delay between visiting a physician and treatment brought about by social-service workers in the clinic population.

Question: In what way does social-service work play its part in the clinic set-up?

Dr. Lombard: At the first visit of the patient to a cancer clinic, information is obtained by the social-service worker regarding the symptoms and their duration, the motivating cause for coming to the clinic, identifying data, age, sex, whether other doctors had been consulted, the interval since onset of symptoms that had elapsed prior to first consultation with a physician and the interval between first consultation with a physician and consultation at the clinic, and the reasons for delay in seeking diagnosis. One of the physicians in charge of the clinic dictates the medical findings and the recommendations. The patient is returned to his physician and treatment is determined by this physician, and effected in some cases

*A "Green Lights to Health" broadcast given by Dr. Herbert L. Lombard on Wednesday, March 27, and sponsored by the Public Education Committee of the Massachusetts Medical Society and the Massachusetts Department of Public Health.

with and in some cases without the assistance of the social-service worker in making arrangements. The worker follows each cancer patient, obtains hospital transcripts of operations and other therapy, and keeps in touch with the patient throughout life. If the patient moves, the record is continued by the worker in the section of the new residence. If the patient leaves the State, attempts are made to contact him through existing agencies. The majority of lost patients are those who have left the State and with whom it is impossible to establish a local contact.

Question: What happens to these records?

Dr. Lombard: All these records are verified, coded, punched and tabulated by experienced workers under the supervision of an experienced biometrician.

Question: Did more people come to the cancer clinics last year than formerly?

Dr. Lombard: Over 5000 individuals attended the cancer clinics in 1939. This was the largest number that has ever been seen at these clinics. However, the cancer patients at these clinics represent only about 10 per cent of the total number of cancer patients of the entire State. It is true today, as in the early part of the program, that the majority of individuals with cancer go to their family physicians. With this in mind, the department is endeavoring to help these physicians as much as possible. This is being done by furnishing them with the latest literature on cancer and conducting teaching clinics for their benefit. This spring, through funds made available from the Federal Government and the Women's Field Army, a monograph on cancer is to be furnished every physician and all libraries in the State. This should be of inestimable help. The physicians are also helped by the Tumor Diagnosis Service, to which every physician in the State may send tissue specimens, suspected for malignancy, for diagnosis.

Question: Has the use of this service been increasing?

Dr. Lombard: The number of specimens received last year far exceeded that of any preceding year. A part of this increase is believed to be due to the extension of the Co-operative Cancer Control Committee.

Question: I understand the function of these committees is to invite a local physician to speak to them on cancer at least once a year. I also understand that all the organizations of a given community belong to this organization. How near completion is the total organization?

Dr. Lombard: We have contacted over 80 per cent of the organizations in the State and invited them to join in this movement. It is expected within the next year that the remaining organizations will be enrolled in the Co-operative Cancer Control Committee. When you consider nearly 20,000 organizations eventually functioning and asking their physicians to address them each year on the subject, the educational value of this program may be seen to be enormous.

Question: What is the relation between the clinics and the educational program?

Dr. Lombard: There is no direct connection between these two organizations. The function of one is limited to education of the public; that of the other to furnish consultative service for the diagnosis of cancer. It is perfectly true that the attendance at the clinics increases proportionately with the amount of education in the community, and for a rounded cancer program both functions are necessary. Administratively, they are entirely separate; from the standpoint of cancer control, they are closely united.

Question: Do you think there is any relation between the Tumor Diagnosis Service and education?

Dr. Lombard: There is no administrative connection between these two services, but the volume of specimens sent to the Diagnosis Service is greater after a community has been organized into the Co-operative Cancer Control Committee than formerly. It is probable that the cancer consciousness which increases in the community with the functioning of the Co-operative Cancer Control Committee stimulates interest and, as a consequence, a larger number of tissues suspected of being cancerous are sent to the service.

Question: What is the connection between the clinics and the hospitals?

Dr. Lombard: Every clinic is located in a hospital. The hospital furnishes the room for the clinic, the equipment and nursing service. Patients, however, are not referred directly from the clinic to the hospital unless their attending physician so desires. All patients are returned to their physician, and he determines the place for treatment. Some patients return to the hospital at which the clinic was located; some go to one of the two state cancer hospitals; while some go to other hospitals.

Question: Is the attendance at clinics weighted by the lower economic group or does it represent a cross section of the population?

Dr. Lombard: The clinics are open to anyone in the State regardless of his financial status. It is true that a large number of the population that attend the clinics are from the low-income group. It is also true that a few people with large incomes go to the clinics, but the cross section of the clinic population is of a lower financial rating than a cross section of the total population of the State.

Question: Does the clinic population present particular types of cancer in the ratio of their total occurrence?

Dr. Lombard: Although the clinic population measures about 10 per cent of the cancer load, it is not evenly distributed by types of cancer. It is heavily weighted with cancers of the mouth, breast, uterus and skin, and contains less than 10 per cent of digestive-tract cancers.

Question: What is the interrelation between the medical profession, the general public and the Department of Public Health in this effort to control cancer?

Dr. Lombard: The interrelation lies primarily in the oneness of purpose — the desire of each, in its own sphere, to improve the cancer situation. The essence of the success of the educational methods of the Massachusetts Cancer Program lies in its inherent sharing of known facts about cancer by a generous and informed profession with a co-operative and receptive public. Fears are not stressed; they are rationalized. Symptoms are not presented as the basis of exact knowledge; they are merely alluded to in the discussion of the large problem. The physician, with his increasing interest in the progressive steps of the knowledge of the disease, presents the subject simply and intelligibly. The public, responding as an individual would respond to a real discussion of an absorbingly interesting subject, rises to the mental challenge of this approach. As a result, all classes, groups, races and professions are united in this basic co-operative and successful program which disseminates exact knowledge concerning cancer. This engenders a realization of the need for prompt action. Exact knowledge and prompt action effect control.

DEATHS

CALLANAN — Francis J. Callanan, M.D., of Boston, died April 21. He was in his forty-fifth year.

Born in Boston, he attended Harvard University and received his degree from Harvard Medical School in 1918. He served his internship at the Massachusetts General Hospital. Dr. Callanan was a trustee of the Boston State Hospital, secretary of staff of the Massachusetts Women's Hospital and a member of the board of directors of the Household Nursing Association.

He was a member of the Massachusetts Medical Society, the American Medical Association and the American College of Surgeons.

His widow, a sister and a brother survive him.

RICE — Walter H. Rice, M.D., of Boston, died April 19. He was in his sixty-ninth year.

Born in Fitchburg, he graduated from Tufts College Medical School in 1896 and from Harvard Medical School in 1899. He also studied in Rome and Munich and had served at Charcot's clinic in Paris.

He was a fellow of the Massachusetts Medical Society and the American Medical Association.

A son, two sisters and a niece survive him.

WALCOTT — Henry J. Walcott, M.D., of Concord, died April 17. He was in his sixty-eighth year.

Born in Concord he graduated from Columbia Institute in New York and received his degree from Jefferson Medical College of Philadelphia in 1896. Dr. Walcott had been medical examiner for the Thirteenth Middlesex District for the past twenty-eight years and surgeon at the state reformatory at Concord for thirty years. He was one of the founders of the Emerson Hospital, Concord, and at the time of his death was the senior member of its staff.

He was a fellow of the Massachusetts Medical Society and the American Medical Association.

His widow, a son, a daughter and three grandchildren survive him.

YOUNG — Edward W. Young, M.D., of New Bedford, died April 16. He was in his fifty-fourth year.

Born in Taunton he received his degree from Tufts College Medical School in 1913. After serving his internship at St. Luke's Hospital, New Bedford, he set up his practice there.

Dr. Young was a member of the Massachusetts Medical Society, the American Medical Association and the New Bedford Medical Society. He was also on the staff of St. Luke's Hospital.

His widow, a daughter, a sister, three brothers and a nephew survive him.

MISCELLANY

ARMY EXPERIENCE FOR PHYSICIANS

An interesting medical corollary to the augmentation of the United States Army during 1940 and 1941 and to the planned large-scale Army maneuvers during the spring and summer of 1940 is the broad medicomilitary experience which a great number of civilian physicians will receive. Medical reserve officers are being used to augment the entire Army Medical Service, which includes everything from small-unit installations to large station hospitals, general hospitals and hospitals designed primarily for the treatment of specific types of cases.

Physicians under thirty-five years of age who are desirous of obtaining extended active duty with the Army but who do not hold reserve commissions are being offered appointments in the Medical Corps Reserve in the grade of first lieutenant, in order to permit them to be placed on such duty. Captains and lieutenants are at present being offered excellent assignments throughout continental United States, and it is hoped that authority will be granted to permit some officers to go to Hawaii and Panama. In addition to having a new and very busy experience in the practice of medicine, the average officer finds the pay and allowances attractive. The pay and allowances for a married first lieutenant amount to approximately $263 a month; for a single first lieutenant to approximately $225 a month; for a married captain to approximately $316 a month; and for a single captain to approximately $278 a month. In most cases the above pay and allowances would apply inasmuch as government quarters are not usually available for officers on extended active duty. In the few cases where government quarters are available, the amounts would be $40, $60, $60 and $80 less per month respectively. In addition, the officer is reimbursed for mileage traveled from his home to his station, and on completion of his tour of duty is reimbursed similarly for the travel to his home.

Application for one year of active duty, or for appointment in the Medical Corps Reserve with a view to obtaining one year of active duty with the Army, should be requested at once by a letter addressed to the commanding general of the corps area wherein the physician permanently resides. In addition, the application should contain concise information regarding permanent address, temporary address, number of dependents, earliest date available for active duty, and that internship has been (or will be) completed; and it should be accompanied by a report of physical examination recorded on the Army Form W.D. A.G.O. 63, which may be obtained from any Army station. From the group of reserve officers placed on extended active duty since August, 1939, over 25 per cent of those within the age requirements of thirty-two years or less for commission in the Army Medical Corps found military service sufficiently to their liking to cause them to take entrance examinations for the United States Army. Inquiries from those residing in the First Corps Area (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut) should be addressed: Army Base, Boston 9, Massachusetts.

CITY AND RURAL HEALTH CONSERVATION CONTESTS

Winners in the 1939 City and Rural Health Conservation Contests were recently announced by the Chamber of Commerce of the United States. These contests are conducted annually by the organization in co-operation with the American Public Health Association for the purpose of furthering adequate health protection and health promotion services throughout the United States. The competent manner in which a community is meeting its health problems is the basis on which the awards are made. This does not necessarily mean that awards are made to the healthiest communities. A group of public-health experts from all parts of the country carefully appraise each participating city and county. Each community is graded on what measures it takes to provide and safeguard its water supply; to furnish adequate and safe sewerage disposal; to reduce infant and maternal deaths; to combat tuberculosis and syphilis; to protect its citizens against other communicable diseases; to ensure

healthy children; to protect and safeguard its milk and other foods; to promote effective co-operation with its physicians and dentists in furnishing necessary services to all those who need them; and to enlarge and improve its lay-understanding of ways and means of preventing sickness and death and of maintaining good health.

In the City Health Contest the winner in Group I (cities of over 500,000 population) is Milwaukee, Wisconsin, with an award of merit to Baltimore, Maryland. In Group II (cities of 250,000 to 500,000 population) Memphis, Tennessee, is the winner, with awards of merit to Louisville, Kentucky, Newark, New Jersey, Dallas, Texas, and Toledo, Ohio.

In Group III (cities of 100,000 to 250,000 population) the winners are tied,—New Haven and Hartford, Connecticut,—with awards of merit to Grand Rapids, Michigan, Yonkers, New York, Reading, Pennsylvania, Springfield, Massachusetts, and Erie, Pennsylvania. The winner in Group IV (cities of 50,000 to 100,000 population) is Newton, Massachusetts, with awards of merit to Evanston, Illinois, Schenectady, New York, Pasadena, California, Madison, Wisconsin, East Orange, New Jersey, Racine, Wisconsin, and Sacramento, California.

In Group V (cities of from 20,000 to 50,000 population) the winners are tied,—Greenwich, Connecticut, and Plainfield, New Jersey, with awards of merit to Hackensack, New Jersey, Winona, Minnesota, Brookline, Massachusetts, Stamford, Connecticut, and Orange, New Jersey. The winner in Group VI (cities of less than 20,000 population) is Englewood, New Jersey, with awards of merit to Asbury Park, New Jersey, Hibbing, Minnesota, and Virginia, Minnesota.

In the Northeastern Division of the Rural Health Contest the winner is Alger-Schoolcraft Health Unit, Michigan. Awards of merit go to District No. 7, Gladwin, Michigan, Chippewa County, Michigan, District No. 2, West Branch, Michigan, Mecosta-Osceola Health Unit, Michigan, Wayne County, Ohio, Saginaw County, Michigan, Barnstable County, Massachusetts, Lorain County, Ohio, and Berkshire District, Massachusetts.

NOTES

The appointment of Dr. Kurt Goldstein as clinical professor of neurology at Tufts College Medical School, made possible by a five-year grant for teaching and research in neurology from the Rockefeller Foundation, was recently announced by President Leonard Carmichael. Dr. Goldstein will begin his appointment on June 1. He was William James Lecturer at Harvard last year, and since 1936 has been on the medical faculty at Columbia University and chief of the Neurological Laboratories at Montefiore Hospital in New York City. Dr. Goldstein will be attached to the Neurological Clinic of the Boston Dispensary.

Five awards for study at the Harvard Medical School during the next academic year were recently announced as follows: George Chase Christian Memorial Scholarship to John E. Skogland, M.D., University of Minnesota '37, of Keewatin, Minnesota, at present clinical instructor, Division of Nervous and Mental Diseases, University of Minnesota; Daniel A. Buckley scholarships to William J. Baker 2M, of Cambridge, and Chester J. Dziengielewski 4C, of Cambridge; Frederick E. Parlin Scholarship to Irving M. London 1M, of Malden; Stoughton Scholarship to George S. Kurland 4C, of Dorchester.

REPORTS OF MEETINGS

WILLIAM HARVEY SOCIETY

At a regular meeting of the William Harvey Society of Tufts College Medical School, held at the Beth Israel Hospital on January 12, Dr. Stanhope Bayne-Jones, dean of the Yale University School of Medicine, spoke on "The Relation of Viruses to Cancer." In opening his address he made some general remarks about the properties of viruses, such as their size and the question of whether or not they may all be considered as living organisms. The isolation of the virus of tobacco mosaic disease and those of other types, he said, is not considered by geneticists and crystallographers incompatible with living matter. The manner of their reproduction was considered as possibly autocatalytic, a sort of spontaneous generation under a new name. In support of such a theory, the experiments of Northrop, Stanley and others were cited. In general, viruses may be necrotizing and destructive, such as that of vaccinia, or proliferative, such as those of contagious epithelioma and chicken sarcoma.

Dr. Bayne-Jones then discussed some examples of tumor formation initiated by a virus. First was chicken sarcoma, which has been produced repeatedly by cell-free filtrates of the tumor. It was suggested that the virus might be the determining factor in the type of tumor resulting. A less well-known example of a virus tumor is adenocarcinoma of the kidney in the frog. Then was cited fowl leukemia, which appears to have had its virus etiology proved, despite the evidence that a leukemic cell is necessary for the transmission of leukemia in mice. And since this latter disease is not transmissible after ultrafiltration, careful scrutiny was advised for all investigations where the presence of cells, as well as of the filterable virus, is possible or questionable.

An outstanding characteristic of these tumors is that one may recover potent cell-free filtrates from the tissue, and in amounts proportional to the growth of the tumor. The same is not true in similar neoplasms in mammals, however. Thus, in the Shope rabbit epithelioma, the virus disappears from the papillomatous growth in many cases, particularly in domesticated animals. And yet these tumors may progress from benign to malignant stages in the absence of demonstrable virus. It has been assumed by Rous and the other proponents of a virus etiology for tumors that this absence of an ultrafilterable factor may be explained by its neutralization by the tissue fluids of large carcinomas.

One of the most convincing experiments in support of the virus theory was the production by Rous of carcinomas in inadequately tarred rabbits by the added influence of the Shope virus. It had been predetermined that the exposure of a susceptible surface to a carcinogenic tar required a minimal amount of rubbing in order to ensure a high incidence of epitheliomas. It was in a group of rabbits proved to be insufficiently treated by such standards that Rous was able to raise markedly the incidence of carcinomas by the supplementary use of the Shope virus.

Dr. Bayne-Jones stated that it was an accepted fact that tumors could be produced by viruses in frogs and fowl and that a virus was demonstrable in these tumors. On the other hand, one has not been able to extract a filterable virus of tumor-producing potentialities from mammalian malignant tumors.

Dr. Bayne-Jones concluded his discussion in an attempt to stimulate his audience to seek the ultimate mechanism of malignant change, whereby cells become "not lawless but assume a law of their own." Any reproducing cell

was represented as being potentially malignant, and any increased potentiality, once present, was considered permanent. The many remote causes of cancer cited by the speaker — those responsible for the "causogenesis" of Murphy — included the hydrocarbons, the azo dyes and simple zinc chloride. The opponents of the virus theory place viruses in this category, while the proponents would like to think of them as intimate causes.

CUTTER LECTURE

The first 1940 Cutter Lecture on Preventive Medicine was given at the Harvard Medical School on January 15, with Dr. John E. Gordon introducing the speaker, Dr. Ludvig Hektoen, executive director of the National Advisory Cancer Council and emeritus professor of pathology at the University of Chicago. His subject was "Cancer Control, with Special Reference to Public-Health Aspects." The speaker inaugurated his discussion by reminding his audience that the prime purpose of any cancer program should be to promote the prevention of cancer and to do the best that can be done at the time for the cancer patient no matter what his means or the stage of his cancer. Dr. Hektoen attempted only to explain the features of the control aspects of the program, leaving the research problem for a subsequent lecturer.

Allusion was made to the basic importance of education in any attempt to bring about the early diagnosis and prompt treatment of a condition where the first step depends on the patient. Special tribute was paid to the capable work in this phase by the American Society for the Control of Cancer. A second fundamental necessity, where there may exist lack of financial means as well as of knowledge, is for governmental subsidy of some nature. The prototype of such a system is that existing in Massachusetts, where there are two state cancer hospitals, a free, tumor diagnostic service and twenty-two state-aided clinics strategically located to care for the needs of the indigent and the medically indigent patient. This example has been more recently followed by an increasing number of states, subsequent to the demonstration by Massachusetts of a definite reduction in the adjusted cancer death rate for women and a similar suggestive trend for men.

One of the pioneer states in the field of cancer investigation was New York, which in 1898 established a laboratory for research, and in 1910 made available a free diagnostic clinic. Dr. Hektoen read part of a recent report from the New York state commission, in which it was concluded that diagnostic facilities were lacking in hospitals of less than 100 beds; that there was a poor geographic distribution of x-ray facilities and tumor clinics so that there was need of 25 additional units in each instance; and that the follow-up of cases and terminal care were not adequate. The commission suggested that the guiding principle should be a tendency to decentralization and to more efficient use of already existing institutional facilities. Further recommendations favored a reorganization of the public-health system to include a cancer-control program; the compulsory reporting of cancer cases; an improved follow-up system for state-aided clinics; and a statistical and epidemiological study of the problem. It was concluded from their study that a proper use of the available knowledge concerning cancer could produce a lower death rate from this condition.

The vast proportions which the cancer problem is rapidly assuming were suggested by an analysis of a survey of the Veterans' Administration, which has 4,000,000 men under its care. Between 1938–42, when the average age of these men is forty-five to forty-nine years, 20,000 deaths might be expected from cancer, while twenty years later this number, under present conditions, would be trebled. This unit has already outlined a plan to combat the scourge by education, early diagnosis and prompt treatment. Six centers have already been set up, the largest with accommodations for 400 men.

Dr. Hektoen went on to discuss the attempt of the American College of Surgeons to elevate the standards of cancer centers by listing approved clinics of more than 100 beds. There are now 307 such clinics, of which 42 are diagnostic only. A steady increase in the number has indicated that their value has been accepted.

In regard to the role of the local physician, the speaker stressed that he is often the first man whose advice is sought for evaluation of a patient's suspicions and for advice as to a proper clinic to attend for diagnosis and treatment. Although there is some limitation at present in diagnosis and treatment, there is none in prevention, Dr. Hektoen stated. Among preventable neoplasms cited were those following exposure to tar, dyes and roentgen rays and those developing on pre-existing areas of chronic inflammation, particularly in the gastrointestinal tract, uterus and skin. A more recently recognized condition which should probably be included is the premalignant degeneration of the oropharyngeal mucosa found in the Plummer-Vinson syndrome subsequent to long-continued malnutrition.

Finally, Dr. Hektoen discussed the role of the Federal Government in the cancer problem. The federal cancer program of May 5, 1937, set up a National Cancer Institute to study the problem in all its ramifications, to correlate various forces, to obtain radium, to train competent specialists, to provide and administer fellowships, and to arrange for national and international consultations whenever necessary for the elucidation of problems. There is also a National Advisory Cancer Council of six members, with the surgeon-general as ex-officio chairman, which makes recommendations for research, spreads educational propaganda and reviews applications of institutions and individuals seeking grants. Appropriations voted for the work amounted to $400,000 in each of the years 1937–8 and 1938–9, with $570,000 being available for the present fiscal year. The sum of $150,000 was used for the erection of a building to house the National Cancer Institute, where research is being conducted into the types of carcinogenic substances, their modes of action, the biology and biochemistry of cancer cells, and the evaluation of new and revived types of therapeutic agents, with particular reference to the efficacy of various roentgen-ray voltages and isotypes of radio-active substances. The speaker also mentioned the advantages resulting from the collaboration of federal agencies with other institutions and local public-health boards.

In conclusion, Dr. Hektoen stated that lack of intelligent organization and co-operation was largely responsible for the inadequate use of available knowledge and facilities, and consequently was an obstacle in attaining a reduced cancer death rate.

HARVARD MEDICAL SOCIETY

A regular meeting of the Harvard Medical Society at the Peter Bent Brigham Hospital on January 23 was presided over by Dr. Robert Zollinger.

The first case, presented by the medical service, was that of a sixty-seven-year-old Pullman porter, who entered the hospital because of pallor of one week's duration and exertional dyspnea for three months. Forty years previously the patient had had a primary syphilitic lesion, and his wife was known to have had a typical syphilitic preg-

nancy cycle. Two years before entry an attack of mild arthritis had responded to bedrest, and six months before there had been an episode of severe migratory arthritis successfully treated by salicylates and bedrest. Exertional dyspnea, first noted three months prior to entry, had become more marked after two months, and the patient was digitalized by his local physician. Paroxysmal dyspnea while at complete rest was a recent development, as was also difficulty in dexterous manual maneuvers. Physical examination revealed a Negro with marked pallor, and gray hair which had been present since the age of twenty-five; dyspnea was easily brought about. The pupils reacted normally, but the fundi showed old and recent hemorrhages and "cotton-wool" exudate. The heart was enlarged, and there was a medium-grade apical systolic murmur. The knee jerks were symmetrically diminished, the ankle jerks absent, and vibratory sensations normal. Laboratory data revealed an erythrocyte count of 650,000, a leukocyte count of 5900, a hemoglobin of 28 per cent and a stained blood smear exhibiting extreme macrocytosis with marked polychromatophilia and numerous nucleated erythrocytes. The platelet count was 80,000, and cell-volume studies showed a hematocrit of 12.5 per cent and a mean corpuscular volume and mean corpuscular hemoglobin concentration about twice the normal values of 85 to 100 cubic microns and 26 to 32 micrograms respectively. The Hinton test was positive. Treatment consisted of transfusion, with subsequent increase of the erythrocytes to 1,000,000. The use of intramuscular liver extract caused an increase in the red-blood-cell count of about 1,000,000 per day and elicited a response of reticulocytes that reached a peak of 29 per cent in four days.

Dr. Soma Weiss, in discussing the case, pointed out the following unusual characteristics: the occurrence of primary anemia in a Negro; the very low values, at least in the present era, for erythrocytes and hemoglobin; the extremely elevated color index and mean corpuscular volume; the manifest response to liver extract within twenty-four hours; and the lack of neurological manifestations in such a severe degree of anemia.

The second case, presented by the surgical staff, was that of a forty-nine-year-old Irishman, who had received a compound, comminuted fracture of the lower leg from being struck by an automobile one month before. There had also been a concussion of the brain, with temporary loss of consciousness, and a back injury. On admission the blood pressure was 90 systolic, 60 diastolic, and the patient showed evidence of incipient shock. Immediate treatment consisted of a 300-cc. blood transfusion followed, when the patient's condition had sufficiently improved, by debridement of the injured tissue of the leg under local and, later, spinal anesthesia. Red blood cells found in the urine on admission gradually diminished in the next few days. On the third day, the temperature suddenly rose and the patient complained of pain in the injured member. A window was made in the cast, which revealed bloody fluid, edema and gas bubbles. Culture revealed an atypical type of *Clostridium oedematis maligni (Vibrion septique)*, and a blood culture yielded the same organism. Therapy consisted of sulfanilamide, 6 to 12 gm. per day, which resulted in a blood level of 12.2 mg. per 100 cc., and roentgen treatment to the local lesion after opening it widely. The urine then became grossly bloody, and x-ray examination revealed a fractured eleventh rib. The temperature suddenly rose to 105°F., and bile appeared in the urine. Consequently, chemotherapy was discontinued and 40,000 units of polyvalent gas-bacillus antitoxin was administered. The jaundice and hematuria gradually disappeared, while the local condition became one of simple staphylococcal infection. Histaminase was employed as a prophylactic against serum reaction.

In discussion, Dr. Zollinger alluded to the improvement in treatment and in prevention of the spread of the dread gas-bacillus infection since 1933, when a similar episode had provoked a hospital epidemic. Dr. Charles A. Janeway emphasized that the isolated organism was not the usual offender *(Cl. welchii)* in civilian gas-bacillus infection and differed from the latter in forming edema more than gas and in being more invasive. Although sulfanilamide was considered probably responsible for the sterilization of the blood stream in this case, its efficacy in the treatment of such cases was not considered proved. The use of antitoxin was advocated as a valuable adjunct, if not as the more important part of therapy. Dr. Janeway finally cited some pertinent experiments on guinea pigs which support this theory. The control group, which received no therapy, died quickly of local and general infection; those treated with sulfanilamide, although showing evidence of local infection and appearing very sick, failed to succumb to the relatively mild systemic effects of the bacilli; of those treated with antitoxin, the majority exhibited neither local nor systemic evidence of gas-bacillus infection. Dr. Carl W. Walter stated that most sterilizing technics tend to foster sporulation, a fact which increases the difficulty of controlling the infection. He advocated, instead, the immediate destruction of bacterial life with heat and the subsequent cleansing of the contaminated articles.

Dr. Walter, the speaker of the evening, presented a motion picture depicting the history, rationale and technic of "Steam as a Sterilizing Agent." As a preamble, Dr. Walter indicated that the concept of sterility, despite its official definition as "that which is free of viable bacterial life," was given a wide variety of meanings practically. In reviewing the historical development of the subject, allusion was made to the classic work of Oliver Wendell Holmes in 1843 and Semmelweis in 1846 on puerperal fever as a communicable disease, largely preventable by proper cleaning by attendants between confinement cases. Lister, from 1860 to 1867, applied Pasteur's theories to the treatment of compound fractures and tuberculous abscesses, and consequently excluded air during operation. It was von Bergmann, however, who in 1882, saw the importance of instruments and dressings as a means of contamination, and advocated their sterilization preoperatively with bichloride of mercury. This was the first effort to substitute asepsis for antisepsis. Dr. Walter then traced the practical development of steam sterilization from Koch, Gaffky and Loeffler in 1881 through Redard, the von Bergmanns, and Schimmelbusch in 1891, who perfected a ritual for preoperative technic which has since persisted largely unaltered.

The theoretical development started with Globbig (1887), who recognized the importance of resistant spores, and progressed via Gruber (1888), who proposed the gravity method of air clearance, Esmarck (1888), who proved the ineffectiveness of superheated steam, Redard (1889), who demonstrated the increase of temperature by an increase of pressure, Lewith (1889), who pointed out the importance of moisture in causing protein coagulation, Teusher (1890), who showed the retardation of sterilization by an oil coating and the importance of regulating the chamber temperature by a thermometer in the exhaust line, Forsch and Clarenbach (1890), who emphasized that the quantity of the steam available rather than its pressure determined the effectiveness of a sterilizer, Rubner (1889), who demonstrated the variation of temperature with composition of air-steam mixtures in vari-

ous parts of bundles, and, finally, Prescott and Underwood, who initiated (1897) the study of the bacteriology of sterilization in the canning industry, which culminated (1923) in the stamping out of botulism.

All these findings have been recently confirmed at the Peter Bent Brigham Hospital, and consequently Dr. Walter is undertaking to educate the medical profession and the lay persons who often operate sterilizing plants, both of which groups have in general failed to accept and employ these fundamental concepts of steam sterilization. The speaker supplied the dialogue for an excellent motion picture which showed the improper traditional and the proper scientific technics of steam sterilization. The problem of air clearance, which is necessary for steam to be effective as a bactericidal agent, was solved by employing only loosely packed materials in unsealed containers or porous wrappers, by placing all layered packs in such a position that a horizontal path was assured for escape of air, and by placing fluffed gauze in the wrists of unfolded rubber gloves. The efficacy of a gravity rather than a vacuum type of air ejector was demonstrated and its economic advantages cited. The proper methods for sterilizing various types of materials were described, with particular attention being focused on rubber gloves, which should be properly prepared as outlined above and put in the upper part of the chamber, for the delay and prolonged exposure otherwise entailed are definitely deleterious to the material.

Dr. Walter explained charts which indicated the efficacy of moist rather than dry heat and the more effective and rapid sterilization by saturated steam than by either a stratified or homogeneous mixture of air and steam due to faulty air clearance. The effects of faulty positioning and overloading as a cause of pocketing air and preventing adequate sterilization were also demonstrated. Another mistake mentioned was the repeated short exposures used, which serve only to reheat the outer layers of any bundle without causing sufficient moistening and heating of the center.

In conclusion, Dr. Walter suggested the following practical measures: the use of temperature rather than pressure as an indication of chamber steam, since an air-steam mixture may attain sufficiently high pressure; the use of a thermometer in the exhaust line to determine the prevailing chamber temperature; the use of a thermo-responsive timer, which records only with sustained temperature and so prevents repeated reheatings. The standard technic, to be carried out by a responsible personnel, should consist of the maintenance of a temperature of 250°F., as measured by the exhaust thermometer, for thirty minutes continuously, as measured by the thermo-responsive timer.

NOTICES

PETER BENT BRIGHAM HOSPITAL

A joint medical and surgical clinic at the Peter Bent Brigham Hospital will be held on Wednesday, May 1, from 2 to 4 p.m. Drs. Robert Zollinger and Soma Weiss will speak on "Vomiting."

Physicians and students are cordially invited to attend.

BOSTON DISPENSARY

A luncheon meeting of the clinical staff of the Boston Dispensary will be held on Monday, April 29, in the auditorium of the Joseph H. Pratt Diagnostic Hospital at 12 o'clock noon. "The Boston Dispensary" will be the subject of the third in a series of talks by different speakers on the past, present and future of the New England Medical Center and its constituent units. Mr. Charles C. Cabot will speak on "Problems of Financing and Support," and Mr. Frank E. Wing will discuss "Its Origin and Its Objectives."

MASSACHUSETTS GENERAL HOSPITAL

A meeting of the Hospital Research Council will be held in the Ether Dome of the Massachusetts General Hospital, on Tuesday, April 30, at 5:00 p.m.

PROGRAM

The Bence-Jones Protein and Pseudo-Bence-Jones Proteins. Dr. Bernard M. Jacobson.

The Significance of Enzymatic Destruction of Synovial Fluid Mucin. Drs. William V. B. Robertson, Marian W. Ropes and Walter Bauer.

The Relationship of Chemical Constitution and Anesthetic Potency to Cortical Potentials. Dr. Henry K. Beecher.

SOUTH END MEDICAL CLUB

The next meeting of the South End Medical Club will be held at the headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston, on Tuesday, May 14, at 12 o'clock noon. Dr. William B. Breed will speak on "Emergencies in Medical Practice."

Physicians are cordially invited to attend.

GREATER BOSTON MEDICAL SOCIETY

The twenty-fifth anniversary dinner meeting of the Greater Boston Medical Society will be held at the Hotel Kenmore, Boston, on Tuesday, May 7, at 6:30 p.m. Dr. Benjamin Spector and Mr. Charles E. Wyzanski, Jr., will be the speakers.

AWARDS FOR OBSERVATIONS ON EPILEPSY

Two annual awards of $100 each are offered by the Laymen's League against Epilepsy for the best original unpublished observations or investigations bearing on the subject of epilepsy. One of these is for work done in a state epileptic colony or mental hospital; the other is for work done elsewhere. Since one object of the award is the encouragement of junior workers, the committee will take into consideration the facilities of the authors; clinical as well as laboratory studies will be welcomed. Awards will be made by a committee of three, composed of the president of the American League against Epilepsy, the chairman of the Section on Convulsive Disorders of the American Psychiatric Association, and a third physician chosen by the officers of the Laymen's League against Epilepsy. It is hoped that winning contributions will be presented before the annual joint scientific session of the first two of these organizations. At the discretion of the committee awards may be divided or postponed.

Papers for 1940 should be submitted by December 15. Further information can be obtained from the secretary of the Laymen's League against Epilepsy, Mrs. N. Bond Fleming, 25 Shattuck Street, Boston.

NEW ENGLAND HOSPITAL FOR WOMEN AND CHILDREN

The monthly clinical conference and meeting of the staff of the New England Hospital for Women and Children

will be held in the classroom in the nurses' residence of the hospital on Thursday, May 2, at 7:15 p.m.

Mr. James T. Pugh, the guest speaker, will present the subject "The Legal Aspect of Medicine."

CONSULTATION CLINICS FOR CRIPPLED CHILDREN IN MASSACHUSETTS, UNDER THE PROVISIONS OF THE SOCIAL SECURITY ACT

Clinic	Date	Orthopedic Consultant
Haverhill	May 1	William T. Green
Lowell	May 3	Albert H. Brewster
Salem	May 6	Harold C. Bean
Brockton	May 9	George W. Van Gorder
Gardner	May 14	Mark H. Rogers
Northampton	May 15	Garry deN. Hough, Jr.
Worcester	May 17	John W. O'Meara
Pittsfield	May 20	Francis A. Slowick
Fall River	May 27	Eugene A. McCarthy
Hyannis	May 28	Paul L. Norton

ST. FRANCIS HOSPITAL (HARTFORD) ALUMNI

The annual meeting of the intern alumni and the regular and courtesy staffs of St. Francis Hospital, Hartford, Connecticut, will be held at the Wampanoag Country Club, West Hartford, on Tuesday, May 21, at 6:30 p.m.

NATIONAL GASTROENTEROLOGICAL ASSOCIATION

The fifth annual convention of the National Gastroenterological Association will be held June 4, 5 and 6 at the Hotel Roosevelt, New York City. Papers by authoritative speakers from various parts of the United States will be given during the mornings and afternoons of all three days, and each will be discussed by well-qualified physicians. The luncheons on all three days will be followed by round-table conferences. The Committee of Ladies is arranging an interesting program of social activities for the families and friends of the visiting members.

Among the scheduled speakers are Drs. C. S. Keefer, Robert Zollinger, R. B. Cattell, I. R. Jankelson and C. W. McClure, of Boston; the discussers include Drs. Carl Bearse, H. G. Dunphy, G. W. Papen and L. F. Curran, of Boston, Dr. R. F. Scholl, of New Haven, Connecticut, and Dr. L. R. Whitaker, of Portsmouth, New Hampshire.

Members of the medical profession are cordially invited to attend. More detailed information and copies of the program may be obtained by application to Dr. Henry Kendall, 16 East 96th Street, New York City.

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Sunday, April 28

Monday, April 29

12 m. Boston Dispensary. Luncheon meeting of the clinical staff. Joseph H. Pratt Diagnostic Hospital.

Tuesday, April 30

*9–10 a.m. The Soldier and His Heart. Dr. P. D. White. Joseph H. Pratt Diagnostic Hospital.

5 p.m. Hospital Research Council, Massachusetts General Hospital.

Wednesday, May 1

*9–10 a.m. Hospital case presentation. Dr. J. E. Paullin. Joseph H. Pratt Diagnostic Hospital.

*2–4 p.m. Vomiting. Drs. Robert Zollinger and Soma Weiss. Peter Bent Brigham Hospital.

Thursday, May 2

*9–10 a.m. Clinicopathological conference. Dr. C. S. Keefer. Joseph H. Pratt Diagnostic Hospital.

7:15 p.m. The Legal Aspect of Medicine. Mr. James T. Pugh. New England Hospital for Women and Children.

Friday, May 3

*9–10 a.m. A Review of Diabetes. Dr. E. P. Joslin. Joseph H. Pratt Diagnostic Hospital.

Saturday, May 4

*9–10 a.m. Hospital case presentation. Dr. J. E. Paullin. Joseph H. Pratt Diagnostic Hospital.

*Open to the medical profession.

May 5 — Boston Doctors' Symphony Orchestra concert. Page 697, issue of April 18.

May 7 — Greater Boston Medical Society. Page 736.

May 9 — Pentucket Association of Physicians. 8:30 p.m., Hotel Bartlett, Haverhill.

May 10–18 — American Scientific Congress. Page 1043, issue of December 28.

May 13 — United States Pharmacopoeial Convention. Page 202, issue of February 1.

May 14 — South End Medical Club. Page 736.

May 21 — St. Francis Hospital (Hartford) alumni. Notice above.

May 21–22 — Massachusetts Medical Society. Annual meeting, Boston.

June 4–6 — National Gastroenterological Association. Notice above.

June 4–7 — American Association of Industrial Physicians and Surgeons. Page 654, issue of April 11.

June 7–8 — American Heart Association. Page 469, issue of March 14.

June 7–10 — American Board of Obstetrics and Gynecology. Page 608, issue of April 4.

June 8 and 10 — American Board of Ophthalmology. Page 719, issue of November 2.

June 10–14 — American Medical Association. Annual meeting, New York City.

June 10–14 — American Physicians' Art Association. Page 332, issue of February 22.

June 23–25 — Maine Medical Association. Annual meeting. Rangeley Lakes.

October 8–11 — American Public Health Association. Page 655, issue of April 11.

October 21 — American Board of Internal Medicine, Inc. Page 369, issue of February 29.

District Medical Societies

ESSEX SOUTH
May 8 — Annual meeting. Salem Country Club, Peabody.

FRANKLIN
May 14 — Franklin County Hospital, Greenfield.

HAMPSHIRE
May 8, at 11:30 a.m. at the Cooley Dickinson Hospital, Northampton.

MIDDLESEX EAST
May 15, at 12:15 p.m. at the Unicorn Country Club, Stoneham.

MIDDLESEX NORTH
July 31.
October 30.

NORFOLK SOUTH
May 2.

PLYMOUTH
May 16 — Lakeville State Sanatorium, Middleboro.

SUFFOLK
May 2 — Censors' meeting. Page 244, issue of February 8.

WORCESTER
May 8 — Worcester Country Club. Dinner at 6:30 p.m. followed by a business and scientific meeting.

BOOK REVIEWS

New Ways in Psychoanalysis. Karen Horney. 313 pp. New York: W. W. Norton & Co., Inc., 1939. $3.00.

This is a thoughtful volume written by an analyst of many years' experience. It discusses many complicated questions in the recent development of psychoanalysis. Any attempt to evaluate the volume must take into consideration Freud's various revisions of his original views in the light of further clinical observations. Like many scientific disciplines, the theory and technic of analysis have undergone changes within the last fifty years. For

instance, its former rather static concepts have given way to a more dynamic viewpoint, particularly since the functions of the ego and its aberrations have become more clearly understood. Psychoanalysis began with a biological orientation as a genetic-instinct psychology; at present, it is both biological and sociological in its presentations and technic. The original, basic ideas have remained; but newer discoveries and observations are being given greater prominence due to increased clinical experience.

It seems that the purpose of Dr. Horney's book is an attempt, as she claims, to rid psychoanalysis of the heritage of the past so that its greater potentialities may develop and thus make a critical evaluation of both psychoanalytic theory and therapeutic technic. She states, for instance, "the purpose of this book is not to show what is wrong with psychoanalysis but through eliminating the debatable elements to enable psychoanalysis to develop to the height of its potentialities." Of course, psychoanalysis is a new science, many of its problems remain unsolved; consequently, her emphasis on this point is not new, as no analyst today believes that psychoanalysis is a finished product.

She emphasizes environment as responsible for creating neurotic conflicts and, in addition, insists on other clinical factors in the genesis of the neuroses. For instance, she believes that sexual difficulties are the effect rather than the cause of neuroses. She claims that the aim of analytic therapy is to lessen the anxiety of the patient and not gain mastery over instinctual drives.

In the course of the volume, she criticizes Freud's biological orientation and claims that he remained an instinct theorist; consequently she insists that neurotic conflicts are also determined by cultural and environmental conditions. She discards the theoretical implications of the Oedipus complex and seems to overlook the fact, even with her sociological orientation, that this complex is the first social experience of the child. Freud in 1923, in a paper on a neurosis of demoniacal possession occurring in the seventeenth century, understood the sociological implications of the neuroses and, furthermore, Ferenczi and Rank, in 1925, emphasized this social aspect of psychoanalysis.

The reviewer believes that it is impossible to make a gap between social setting and either psychological or biological setting. This is shown by the fact that neuroses may assume different clinical forms under different cultural conditions. According to Dr. Horney the patient's neurotic difficulty is a compulsory need to appear perfect, whereas according to Freud it is the unconscious feelings of guilt which form the main obstacle to the cure of the severe neuroses. She maintains that Freud's work has certain limitations in the understanding of cultural factors and that he remained an instinct theorist. In reply to this viewpoint it can be stated that the symptoms of the neuroses, besides being cultural or sociological impacts, are also psychological; cultural conditions are produced by instinctual drives and, inversely, instinctual drives produce cultural patterns. According to her, also, anxiety, which is an essential symptom of every neurosis, is frequently the result of being in some acute dilemma without being aware of it; whereas, according to Freud, the therapy of anxiety is a search for repressed drives and ego defenses. Her insistence on active therapy in analysis is not new, since this procedure has been utilized for some years. The important aim of therapy is to carry the analysis along until the patient can find a satisfactory solution in his life situation.

It must be emphasized that psychoanalysis began as a medical discipline and still remains so; and her challenge that it neglects the social aspect of the neuroses is merely her own insistence on revision, which, when the book is carefully read, is not so revolutionary as the uninformed reader might be led to believe. For instance, her statement that anxiety in the neuroses is the result of the failure of the specific safety devices of the ego to operate, is but another way of stating that this anxiety is due to a weakening of the defenses of the ego, from whatever cause.

A History of Tropical Medicine: Based on the Fitzpatrick Lectures. H. Harold Scott. 2 vol. 1165 pp. Baltimore: William Wood & Co., 1939. $12.50 per set.

These volumes are based on the Fitzpatrick Lectures given by the author. He begins with an account of the slow progress of hygiene at sea and in the military service in the eighteenth and nineteenth centuries and, to complete the background, discusses early conditions in some of the British dependencies. Subsequent chapters are devoted to the principal tropical diseases. Their history is traced in detail to the earliest available records.

The accounts of malaria, yellow fever and the avitaminoses are likely to be of special interest to Americans. With reference to malaria in America, the statement is made (page 128) that "it is the general belief that malaria was originally introduced either from Europe or by the slaves from Africa." Although the reviewer shares this opinion, he doubts that it has received wide acceptance.

A long chapter on yellow fever scarcely mentions Carter's important contribution to the history of this disease (*Yellow Fever: An epidemiological and historical study of its place of origin.* Baltimore: Williams & Wilkins, 1931), but in other respects it is admirable. The chapter on the avitaminoses is devoted largely to beriberi; the early history is excellent, but the progress of the past ten years is not mentioned. A short chapter on the Panama Canal, another on the slave trade with reference to disease, and a series of short biographies of persons who have made great contributions to the subject of tropical medicine are likely to prove of general interest.

The reviewer is impressed with the magnitude of the task undertaken by the author and with the success which he has achieved in providing a most useful book of reference.

The International Medical Annual: A year book of treatment and practitioner's index. Edited by H. Letheby Tidy and A. Rendle Short. Fifty-seventh year. 602 pp. Baltimore: Williams & Wilkins Co., 1939. $6.00.

This annual is in its fifty-seventh year. The book covers the whole field of medicine as viewed by numerous English authors. There is the usual general index, and a series of excellent illustrations from a wide variety of publications. The reviews are carefully done, and this is an important addition to the medical literature which aids the physician in keeping abreast of rapidly advancing medical research.

Les Embolies Cérébrales: Études de pathologie expérimentale sur les embolies solide et gazeuse du cerveau. Maurice Villaret and René Cachera. 134 pp. Paris: Masson et Cie, 1939. 32 Fr. fr.

This is a treatise in regard to experiments concerning the pathology of embolism of the brain. The authors have worked largely with dogs and have taken advantage of the cerebral window for the observation of the vessels in the living animals, as developed by Forbes at the Harvard Medical School. It is a valuable work in a small field.